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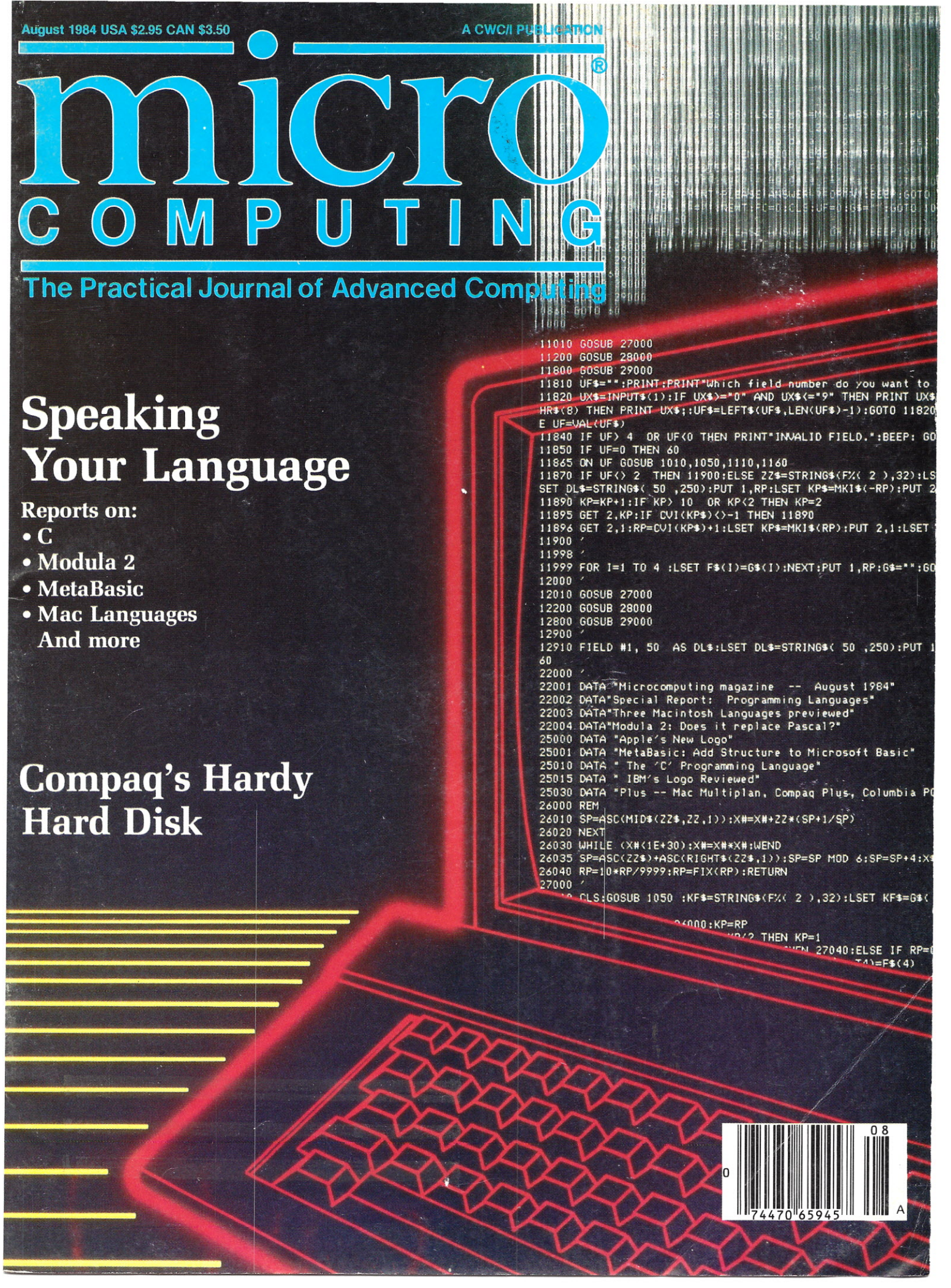

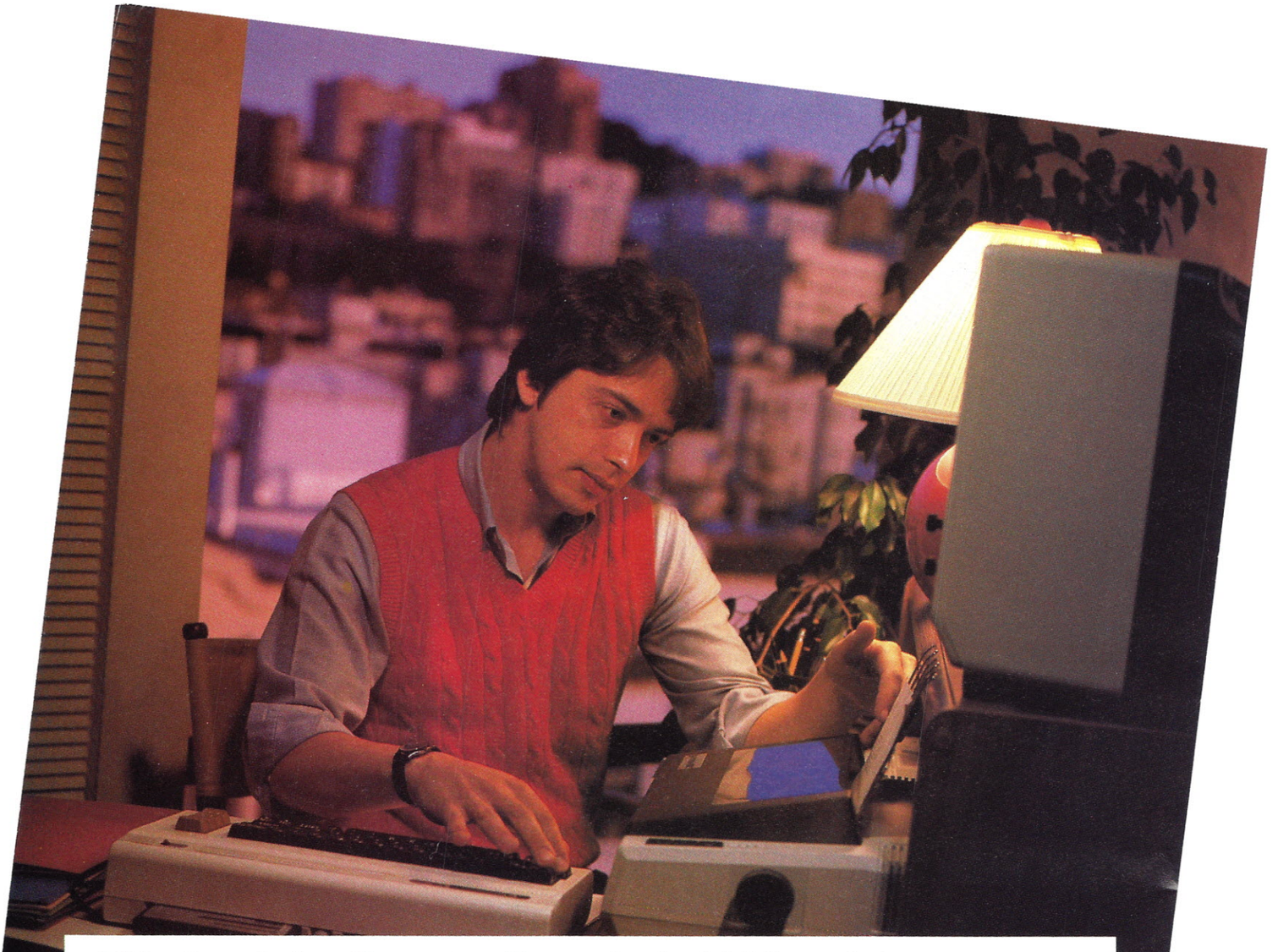

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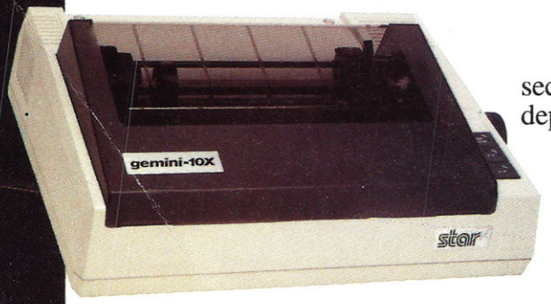

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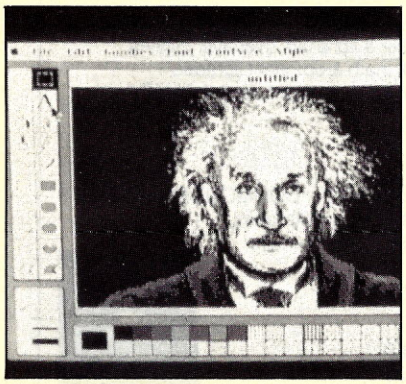

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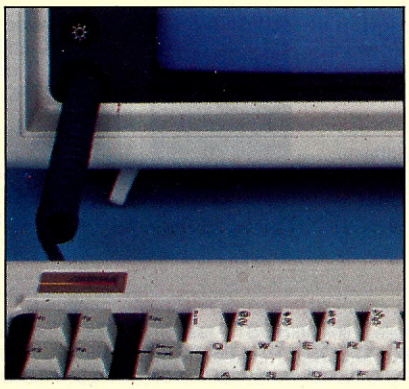

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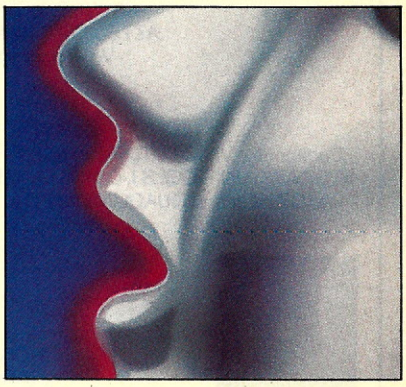

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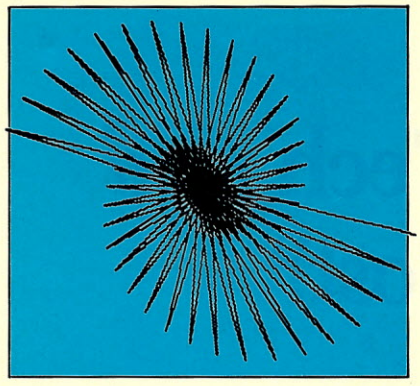

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The Edit Mode

By Eric Grevstad

High Tech *and* Low Cost?

Getting Micro Power To the People

Five mornings a week, I leave my one-bedroom apartment, get into a Honda Civic the bank owns half of and drive to an office I share with *Microcomputing*'s two tech editors and several machines I can't afford.

There's a Sony SMC-70 in its boxes, an Apple III gathering dust and an IBM PC that's the office mule; there's also a $2495 Macintosh if I want to draw pictures. My own desk usually has whatever machine I'm reviewing; 'til last week it was a $4995 Compaq Plus, but I'm writing this on a $3220 IBM Portable PC.

These are fine, sophisticated computers, but they're out of my price range. I have a word processing workhorse at home, a TRS-80 Model 4P; it lists for $1799 with 64KB RAM and two disk drives, but I talked the Radio Shack dealer into $1500 even.

Computers, to say the obvious, are too expensive. People paid a lot of attention last year to low-end micros' price plunge, when TI, Mattel and Timex went into lemming mode and the $200 Commodore-64 emerged as the king of KMart computing. But price tags bounced back up, first due to shock at the discount wars' casualties and then due to PCjr's debut at $1300. While IBM trimmed prices to $1000 in June, Apple endorsed the $1300 figure with IIc.

As for business or desktop models, $3000 is still the unofficial ante. Macintosh is flying off the shelves at $2495, though it's been widely reported that Apple chairman Steve Jobs felt it could sell profitably for $500 less. (President John Sculley, it's said, held out for the higher price.)

There are some economical MS DOS machines, many of which sacrifice PC compatibility for value. The Sanyo MBC-550 is a bargain at $999, with EasyWriter, WordStar and CalcStar thrown in free. Even though it's mechanically what car dealers call a stripper (128KB RAM, one single-sided disk drive and no monitor), it makes it hard to justify paying three times as much for another brand.

This Year's Trend: Down a Notch

Taking the Apple and IBM home micros and the lower-priced MS DOS machines together, though, you can see encouraging signs for the second half of 1984. Both the IIc and PCjr are polished, cleverly engineered home machines that deserve to do well, though they both cost too much and are flawed compared to their ad claims (the IBM's keyboard is hideous and the IIc isn't really portable). More important, they indicate a trend bigger than last year's mere price fluctuations: the whole computer hierarchy is moving one step down.

By that, I mean that eight-bit machines of the Apple II type, which formerly cost around $2000, are dropping to half that, leaving their place in small businesses to become strictly home computers. (In this regard, the 64KB, one-disk Apple IIe with monitor for $1000 is more significant than the screenless IIc at $1300.)

This leaves the $2000 price point, for high-end home and small- to medium-sized business use, vacant; it's being filled by 16-bit micros that used to cost $3000. Similarly, today's serious business buyers are getting more for their $3000 than the plain PC of a year ago.

This downward move is excellent news, more important than mice or windows in terms of getting more computing power to more people. I'm happy to see faster sorts and

more disk storage, but I'm even happier to hear announcements like those New Products/Review Editor Amy Campbell brought back from New York on May 15.

Good News from Two Long Shots

On that day, two of the (to date) smaller players in the micro market unveiled their summer releases. The first, NEC's Advanced Personal Computer III, takes an unflattering photo, but it sounds better than it looks: 128KB RAM, an eight MHz 8086 chip (that's the NEC, not Intel, 8086, thank you), a real keyboard with the shift key where it should be and 640 by 400-pixel graphics on a 14-inch monochrome monitor. The best part is the price: $1995 with one drive.

If MS DOS isn't enough, NEC says, the APC III will support Unix. With 256KB RAM, a ten-megabyte hard disk and appropriate software, it'll cost $5320 compared to $6755 for a comparable PC XT with IBM's PC/IX Unix package.

The second May 15 debutante comes from Franklin Computer Corp., which has finished its own Apple-compatible DOS, settled out of court with Cupertino and regained founder Joel Shusterman, who left Franklin in 1977 but is back as executive vice president and acting president. Shusterman acted as emcee for the Hayden Planetarium launch of Franklin's CX, a cute 25-pound transportable with a IIe-compatible keyboard and a perhaps squint-creating seven-inch screen.

The top of Franklin's new line, the CX-2M, promises to be two machines in one: a 64KB Apple II Plus clone with a 6502 processor, and a 128KB MS DOS suitcase with an 8086. The two drives can read both 35- and 40-track single- and double-sided disks. (To run even more software, there'll be an optional Z80 CP/M card.) GW Basic and WordStar are included, as is an integrated word processing, spreadsheet and graphics program called Franklin Office Manager.

We'll have to wait to review the CX-2M and see how many MS DOS programs it runs; also, I'm not sure about the II Plus software library in an increasingly IIe and IIc world. But Franklin plans to sell the dual-processor suitcase and bundled software for $2295 (the bottom of the line, an Apple-only version with one drive, seems a bit steep at $1395). Double compatibility and competitive pricing could give Franklin a winner.

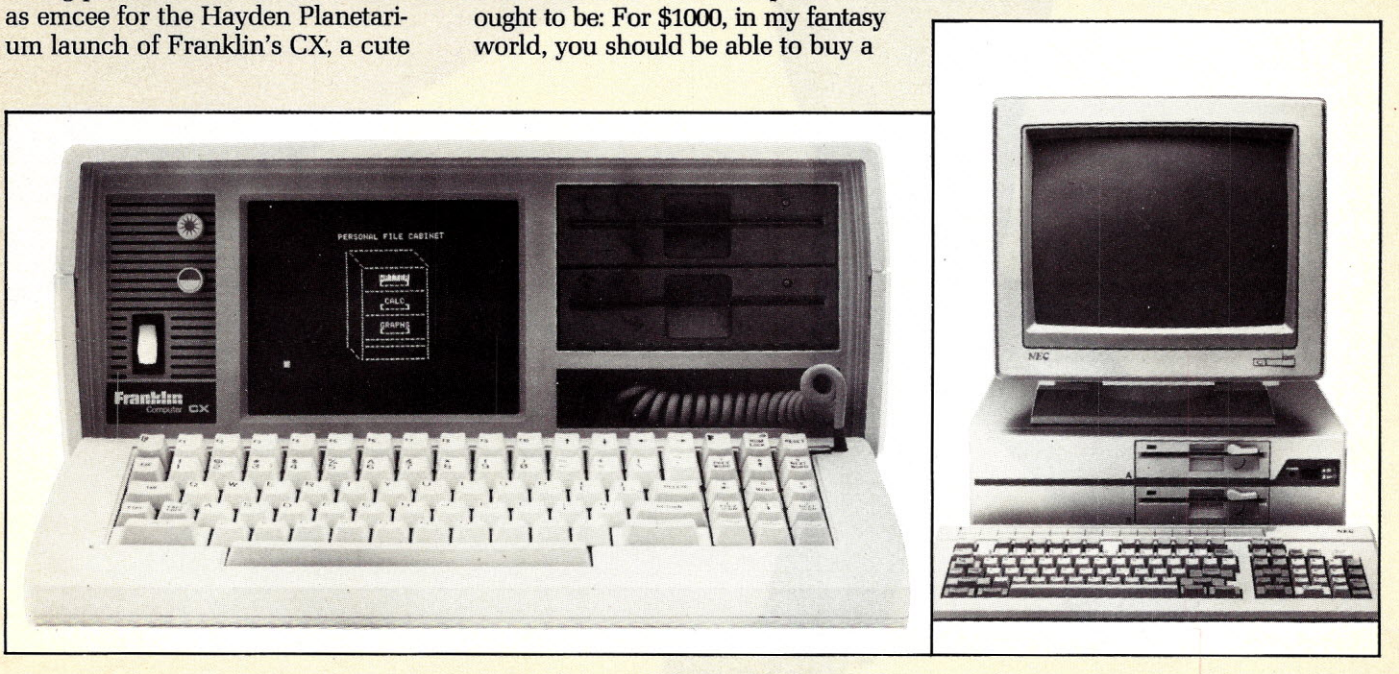
Suggested Retail Prices

Obviously, I'd like to see NEC-, Franklin-, or Sanyo-style prices become the rule rather than the exception. I think the trends are clear enough for me to be arbitrary or at least to declare what computer costs ought to be: For $1000, in my fantasy world, you should be able to buy a really first-rate eight-bit system, with 64KB RAM and two drives (or perhaps 128KB and one). Modest but serviceable MS DOS systems should be available for $1000 and up, with nice ones (128KB, two double-sided drives) starting around $1500.

By the $2000 mark, I'd expect full-fledged PC compatibles and transportables (256KB or 512KB RAM, bells and whistles). $2500 should bring super-PCs, high-speed and high-resolution systems like the Tandy 2000, or conventional clones with hard disks. For $3000, corporate users deserve mammoth memories, hard disks, multi-user capability and other supermicro features.

These are dreams, but short-term or practical ones. We're dedicated to the proposition that computers are good things and belong in as many hands as possible; applauding high-tech power on one side and easy-to-use icons on the other, we tend to overlook the obvious—that the democratization of computers won't happen 'til people can afford them.

Not that I'd trade in my Model 4P. I recently read that several *Car and Driver* editors, after testing Corvettes and Porsches all day, drive home in Honda Civics.□



Franklin's CX, NEC's APC III: MS DOS micros with down-to-earth prices.

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You'll also find DisplayWrite Legal, a dictionary of about 16,000 words that a lawyer might need to check.

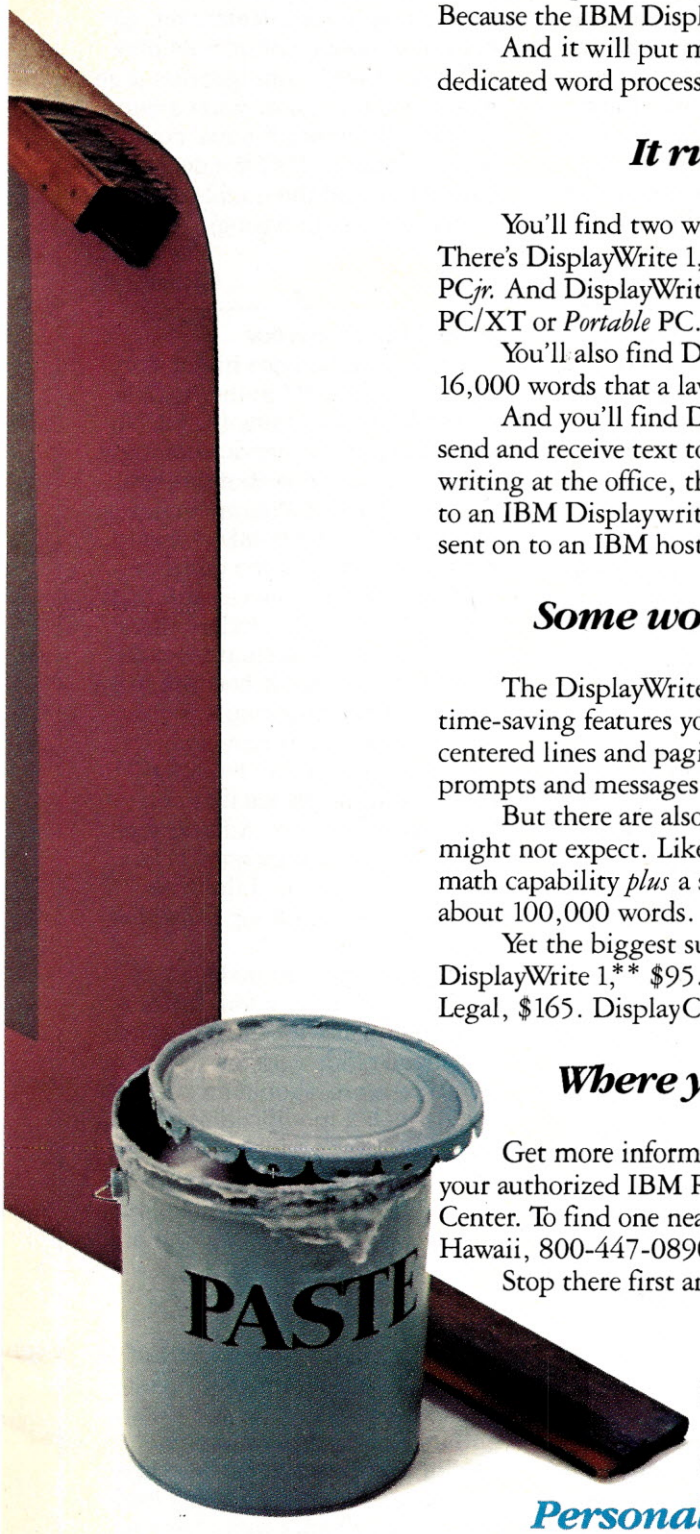
And you'll find DisplayComm, which lets your IBM PC send and receive text to and from other IBM PCs. If you're writing at the office, this program could also let you send text to an IBM Displaywriter down the hall. (From there, it could be sent on to an IBM host computer for distribution.)

Some words on high function.

The DisplayWrite word processing programs give you the time-saving features you'd expect from IBM. Justified margins, centered lines and pagination, for example. You'll even have prompts and messages to help guide you along.

But there are also some features in DisplayWrite 2 you might not expect. Like easy column formatting, four-function math capability *plus* a spelling checker based on a dictionary of about 100,000 words.

Yet the biggest surprise of all may be the price.* DisplayWrite 1,** $95. DisplayWrite 2, $299. DisplayWrite Legal, $165. DisplayComm, $375.



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Letters

Ooops. . . .

In the May issue of *Microcomputing*, Mark Robinson should have been listed as co-author of "The Sanyo MBC-550: How Much Is That Micro?" He collaborated with Terry Kepner on the article and conducted the interview with Sanyo's Arthur Shebar. Sorry, Mark.

A CP/M Card Misdeal

Thank you for the positive review you gave to our CP/M Plus Card and to our Z-Card II in your May 1984 issue (p. 66). We are proud of our products and feel that the review was a fair comparison of the CP/M cards now available. There are, however, some points that I would like to comment on.

Contrary to the review, the ALS CP/M Card does run "banked" CP/M 3.0. Our card has 64KB onboard RAM and, in addition, can access 52KB of Apple RAM for a total of 116KB. The only product for the Apple II we know of that runs nonbanked CP/M 3.0 is the $495 64KB version of DRI's Gold Card.

As you correctly noted, we did experience delays in receiving the GSX-80 Graphics Interface software from Digital Research. GSX-80 now has been received, debugged and presently is in production.

The technical support number is toll-free. Tech support can be reached at 408-730-0307 between 9 a.m. and 3:30 p.m. Pacific time.

Lastly, our Z-Card will soon be replaced by a new product, the Z-ENGINE. This product has been tested on Apples, Apple workalikes and 16KB RAM cards.

I hope that the information above will be of value to your readers. Again, thank you for the objectivity of your review.

George Johnson
Director of Marketing
Advanced Logic Systems

Sanyo Not So Rosy

Terry Kepner's glowing review of the Sanyo MBC-550 in the May *Microcomputing* (p. 74) should assure him of a position in Sanyo marketing, but certainly paints a more rosy picture of the machine than it deserves. It is too bad you talked only to the manufacturer and not to owners of the machine.

I have owned a Sanyo 555 for some time now. I expected a limited amount of compatibility with the IBM, since every advertisement published claimed 80–85 percent compatibility with IBM. I assume this number came from Sanyo. I thought that even if it were ten percent compatible with IBM it would be a bargain, since I have a large amount of IBM software in my office already and would like an inexpensive second machine for my own desk. Besides, I thought, the bundled software would be a good start.

To shorten the sad story, CalcStar turned out to be the most useless spreadsheet ever invented. It's so slow it cannot do autorecalculate and it has no trigonometric functions at all, in addition to other problems. I have not been able to make any of my other software run on the Sanyo except TurboPascal, which runs fine.

I must add that the documentation you praised doesn't tell you how to open a disk file! Nor does it give any information on how to operate such commands as Sound, Screen or DEFINT; in fact only about half the commands are documented. The manual included suggests that you purchase the Sanyo *Basic Reference Manual*. As I write, this book still isn't available.

So far (six months after introduction) I have *never* seen a software ad claiming to run on a Sanyo. Rumors abound, of course, and I did find one firm with a game for sale, but last time I called the phone had been disconnected.

In all seriousness, my son's Atari would have been a better choice for my engineering work. At least then I could run VisiCalc and graphics programs that dump to the printer.

The Sanyo telephone support (I got the dealer support number from a disgruntled dealer who got tired of handling complaints himself) has ranged from ignorant (one operator didn't know what a Sanyo *Basic Reference Manual* could be) to optimistic ("all the dealers have them, and the double-density drives too"—both wrong).

Pat O'Neil
Gilbert, AZ

A Striking Discovery

There is bad advice in the story "Don't Strike Out" in the April issue of *Microcomputing* (p. 94). No electrical panels—service entrance, lighting, power distribution—are designed for installation of devices other than circuit breakers inside the box. Modifying the panel or adding "foreign" devices automatically voids the UL (Underwriters' Laboratories) listing and tends to make the box unsafe because more heat must be dissipated and the box becomes more crowded.

This is true for any manufactured electrical device that concerns modifications. Adding such a device even to a receptacle box may make it unsafe if the wire count (number entering or exiting the box) is high.

I suggest that you make an extension cord using a four-by-four-inch square box for the receptacle and metal oxide varistor.

Furthermore, should an accident occur, such a modification could be grounds for an insurance company to avoid paying a claim!

C.E. Muhleman
Kokomo, IN

Plus or Minus

I am puzzled by the density of your reviewer of Personal Investment Analysis. (March *Microcomputing*, p. 146). Apparently, the vendor of this particular package has decided to make making backups of his software easy, even for

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those without the capability of breaking protection.

The reviewer reminds the user that duplication and distribution (duplication other than for the buyer's use) is illegal under copyright laws. In other words, Wiley is saying this software isn't protected by encrypting schemes, but by law. I think this is laudable; it doesn't seem to me that the bonus of being able to back up this program should be presented as a minus. It is a user convenience, and your reviewer should note it as such.

Bruce R. McFarling
Oxford, OH

Understanding Software Pirates

Your editorial, published in the May 1984 issue of *Microcomputing* ("The Chinese Syndrome. . ." p. 6) dealt with an important issue in microcomputing. The issue of software piracy can't be understood unless the psychology behind the people involved in microcomputing is understood.

There is no question that crimes like computer embezzlement, fraud and software theft are no more ethical than common larceny. But, because computers hold a certain mystique, those engaged in these crimes have become folk heros.

Any software and hardware theft prevention system will provide a challenge to modern hardware hackers with a software background. This type of person exists in large numbers because of pay TV and the cable decoder scams that these people engineer. They need to go onto bigger and better challenges to make the otherwise unadventuresome computer hobby thrilling and exciting.

A psychological approach to a highly technical problem may seem farfetched, but the end users are human. It is impossible to prove that software theft is wrong to software pirates and their supporters because they can rationalize their theft.

The only way to stop them is to get a good copyright law for software and enforce it. Giving software pirates a challenge will only give them a way to prove that they are smarter than the professional programmer. It will also give the latter a false sense of security.

Alan Richards
Anchorville, MI

Sanyo Glossed Over?

After reading "The Sanyo MBC-550. . ." in the May issue of *Microcomputing*, I feel compelled to write. As an owner of a Sanyo MBC-555 (for several months now) and as a systems utilities developer on an IBM PC XT, I feel there are some points Mr. Kepner glossed over and/or misunderstood that should be cleared up.

First there is his discussion of video RAM. He states that there is 48KB of video RAM, with 16KB being in user RAM. In actuality, there is 16KB of video RAM that can be allocated to any 16KB section of RAM. Video RAM is normally allocated to the top 16KB of RAM (address 1C000–1FFFF on a 128KB machine).

Second, he states that there are five function keys (ten with the shift), which causes a problem since the Insert/Delete functions are on the same key. Besides making no sense, this is wrong. There are the ten function keys mentioned plus a second set of ten when in Basic. These are the numeric keys across the top of the keyboard when used in conjunction with the CTRL key.

Third, it is important to note that for Basic programs from an IBM PC to run on the Sanyo, the programs must be saved in ASCII form. Otherwise, they won't be able to load. Also, if programs are saved using DOS 2.0, it will not load unless the disk is formatted correctly (format d:/1/b formats the disk to single side with eight sectors per track. Singled-sided formatting alone won't work).

I have both interpretive and compiled BasicA programs that run on the IBM PC and the Sanyo (including assembly language calls to BIOS routines) so there is some compatibility. These are the kinds of notes that are important to the novice user.

Finally, Mr. Kepner states that the manual "describes all subjects completely and accurately." Well, the manual (which contains typographical errors) lists commands in a haphazard manner. For instance, CHKDSK isn't listed under the command section of DOS, but rather under the introduction to DOS. Many descriptions are cursory at best—EDLIN has only a two-page description. Also, Debug is not listed at all. The section on DOS, poor as it may be, is superior to the Basic section. In this section Sanyo omits descriptions of commands such as Open, Close, Peek, Poke, INP, Field, LSet, RSet, CVx, Tron, and unfortunately the list goes on. These commands are vital to any serious programming and should not be left out.

I must also state that the manual that comes with the computer states that you may want the Sanyo *Basic Reference Manual*. But, this is not yet available. The technical reference is sparse (especially compared with the IBM technical reference for the PC). And finally, although the manual does describe how to install the RS-232C card, that card is also unavailable through any local authorized Sanyo dealer.

Let me sum up by saying that I am very pleased with my Sanyo and the accompanying software. For a novice, however, the manuals are severely lacking and support may be less than hoped for. Mr. Kepner, however, appears to have given the Sanyo a quick once-over and liked it, as I did, but gone on to praise facets that did not warrant any praise.

Kevin C. Jones
Cincinnati, OH

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Overview

By Frank J. Derfler, Jr.

The Making Of the Microcomputer

IBM and Apple Redesign, Repackage And Reap the Rewards

In this election year I'm again reminded that packaging and marketing are everything for candidates and for computers. Most political candidates struggle to effectively package old ideas so they look new. An incumbent in an elected position markets himself in a new way to convince the public of his ability to adapt to modern times.

Old Idea, New Wrap

The same thing is true in the computer industry. Packaging old features in new ways can be an effective method of extending the life of a product line. The people at Apple Computer have done an excellent job of demonstrating how repackaging can be even more effective than starting development from scratch. The Apple IIc is a repackaged product that seems to have set the industry on its ear. . . at least in the short run.

The Apple IIc was announced at a well-orchestrated pep rally, dubbed Apple II Forever, held in San Francisco on April 24, 1984. All political candidates know that the best campaign kick-off rallies are those in front of a hometown crowd. It seemed like all of Silicon Valley turned out to help Apple's John Sculley kick off the IIc campaign. The IIc is a redesigned and repackaged Apple IIe. It's housed in a smaller, slimmer case than the traditional Apple II package and, according to the press releases, has eliminated all of its old bad habits while learning some new good ones.

Appealing Apple

The Apple IIc looks appealing. The cabinet design is certain to win awards. There's a nice keyboard with separate cursor control keys and keys for 96 upper- and lowercase characters. The IIc package has a 5¼-inch half-high disk drive tucked into the right side of the machine, and both color and monochrome monitors are available that match the styling of the cabinet.

The strength of the IIc is that it's a good old idea in a new package. The Apple IIc will run something like 90 percent of all of the existing Apple II software. It uses a smaller number of separate integrated circuits than even the redesigned IIe and features a low-power version of the Apple II's 6502 processor doing the computing. The random access memory in the IIc is arranged in two separate blocks of 64KB, giving software authors the ability to write programs that can use 128KB of RAM. The new marketing approach of the Apple IIc includes a price that makes it competitive for the home and education market: $1295.

Under the Wrapper

I admire the packaging job Apple has done. This product is well-designed, well-promoted and well-positioned in the market. The tried and true Apple II architecture is, however, both the good news and the bad news. Apple Computer Inc. makes a lot of claims. One of the most irritating claims from Apple that appeared in some television advertising last year was that Apple Computer "invented" the personal computer. Even granting literary license for advertising hype, that claim is pretty far out of line.

The spokesmen for Apple also frequently state that more software is available for the Apple II than for any other microcomputer system. Technically, this may be true, but a great deal of the software marketed for the Apple II is pretty unsophisticated stuff with low sales volumes. I

don't believe that the amount of serious Apple DOS software available for business and education can compare with the volume available in the MS DOS market.

Modern software is memory hungry. You can't do the kinds of integrated information transfers and provide the kinds of services to the user that products such as Symphony from Lotus or Framework from Ashton-Tate provide without using loads of memory or performing many slow transfers of portions of the program from the disk drive. Software companies writing programs for Apple's Macintosh have found the 128KB of RAM currently available on that system to be a real barrier to the movement of software into the Mac and the development of new programs. Memory is cheap and getting cheaper.

The Mac's limitation on memory is temporary. The system is designed to use 256KB RAM chips that are still not available in a large enough quantity to meet the demand. This situation will improve by the end of the year (coinciding with the release of more memory-hungry programs for the Mac), but the Apple II architecture will always be limited by its eight-bit processor. Even the 128KB capacity of the IIc is done with mirrors. Not all software can take advantage of this memory, and the speed of processing will never be the same as 128KB of RAM in machines with 16-bit processors. The standards of the software industry are about to go through a metamorphosis; the Apple II architecture won't be able to keep up with the changes, no matter how well it's repackaged.

The IIc vs Junior

When the IBM PCjr was released, it was clearly positioned directly against the Apple II in the home and education markets. The Apple IIc is a direct and effective challenge to the Junior that meets Junior's price and emphasizes some of its weaknesses.

The PCjr has a controversial keyboard with keys requiring double the normal effort to depress. It has limited expansion capability, and the serial communications port and parallel printer port are extra-cost options. The Apple IIc has a nice keyboard, two serial ports and expansion capability built in. It's now apparent that IBM did a poor job of lining up software houses to market programs in the cartridges Junior is designed to use. If more program cartridges had been available initially, the sales of Junior would have been better and the present critics would be mute.

Software standards are about to go through a metamorphosis—the Apple II architecture won't be able to keep up, no matter how well it's repackaged.

The ClickArt program for the Macintosh gives every Mac user the ability to use and modify more than 100 different drawing and images, from Einstein to Boy George.

The marketplace already holds thousands of programs that can run on the Apple IIc, and this ready pool of software can hide a multitude of other shortcomings. If IBM had been more aggressive in its educational marketing instead of simply expecting Junior to ride on the coattails of the PC, then Junior's keyboard would be recognized for the features that make it good in the classroom—particularly an elementary or junior high school classroom. Apple is marketing the Apple IIe to the education market with very steep discounts.

In the long run, the PCjr has more potential for growth than the Apple IIc. The Junior is a system that was deliberately limited, but its support is growing and the system will soon be able to expand into something better than the standard PC. The Apple IIc has been extended and optimized as far as it can go. If I only had $1295 to spend and wanted the best machine for the long run, I'd still choose the IBM PCjr. But in the larger machines, the battle between improved versions of the IBM PC and the Macintosh with 256KB RAM chips has yet to start. The outcome of that battle, like a political race between a well-positioned incumbent and a challenger with smartly packaged new ideas, will be difficult to predict.

Art for the Macintosh

Speaking of packaging software for the Macintosh, a respected family in the software business has put together a new kind of package for the Mac that takes advantage of its graphic capabilities. The T/Maker Company is a family-run business that has done a good job of marketing its T/Maker integrated spreadsheet and word processing software for CP/M and MS DOS machines.

ClickArt, the new product it's marketing for the Macintosh, is different. ClickArt is actually a file of more than 100 professionally drawn images, ranging from full-page illustrations to useful technical symbols. The MacPaint and MacWrite

programs supplied with the Macintosh can be used to recall and modify the ClickArt images to create invitations, announcements, charts and slides and add an artistic touch to business reports.

The ClickArt disk contains images such as arrows, stars, fancy borders, wine glasses and bottles, city skylines and cartoons. The disk also has full-screen drawings, such as popular cars, Michelangelo's *David* and famous personalities like Albert Einstein and Boy George—something for everybody.

ClickArt is an example of the clever packaging of a simple idea. With a price of $49.95, I predict that it'll become a standard part of almost every Macintosh owner's library. Families of these art libraries will certainly expand and become available for groups of Macintosh users with many different interests. Good packaging has made a new kind of product.

Terminals have been virtually ignored in the Golden Age of the individual micro (1980–1984).

Packaging a Terminal

In the Golden Age of the individual microcomputer (1980–1984), we've almost ignored terminals. Terminals usually consist of a keyboard and display device that do very little, if any, local processing of data. The main job of a terminal is to communicate with some host system where the main program is run and the files are stored. The production and sale of terminals are a big business in the mainframe computer industry.

RCA's All Purpose Terminal offers flexibility and an appealing price tag.

The microcomputer industry is going to start to take notice of terminals more and more as we move into the Age of Shared Files (1985–??). Multi-user operating systems like Unix will reduce the emphasis on local processing and increase the need for low-cost terminals that can provide several people with the ability to read and write the same file of information through a database program. Some terminals have no special capabilities for highlighting text, using reverse video, displaying underlining or blinking portions of the text.

In these simple terminals, the cursor moves across the screen in the same way a typewriter moves across a sheet of paper. The cursor has no ability to jump around the screen so that words and letters can be displayed anywhere at any time. This kind of terminal is often referred to as a "dumb" terminal or even a "glass teletype." This phrase relates to the way these simple terminals provide little in the way of a display that an old mechanical teleprinter could not. Other more sophisticated terminals (many containing microprocessors and internal programs) can create impressive displays using color and graphics in response to commands generated by programs in the host computer.

No Standard

A major problem in the industry is that the commands used to control these displays aren't standard. There are many computer manufacturers who each have their own tables of codes that terminals connected to their systems reply to. If you have access to more than one host computer system, you might find that you need a separate terminal for each system. Additionally, there are times you might want to connect to a host system directly using an RS-232C serial cable, and there are times you might want to connect to a host or information utility such as CompuServe through a telephone modem.

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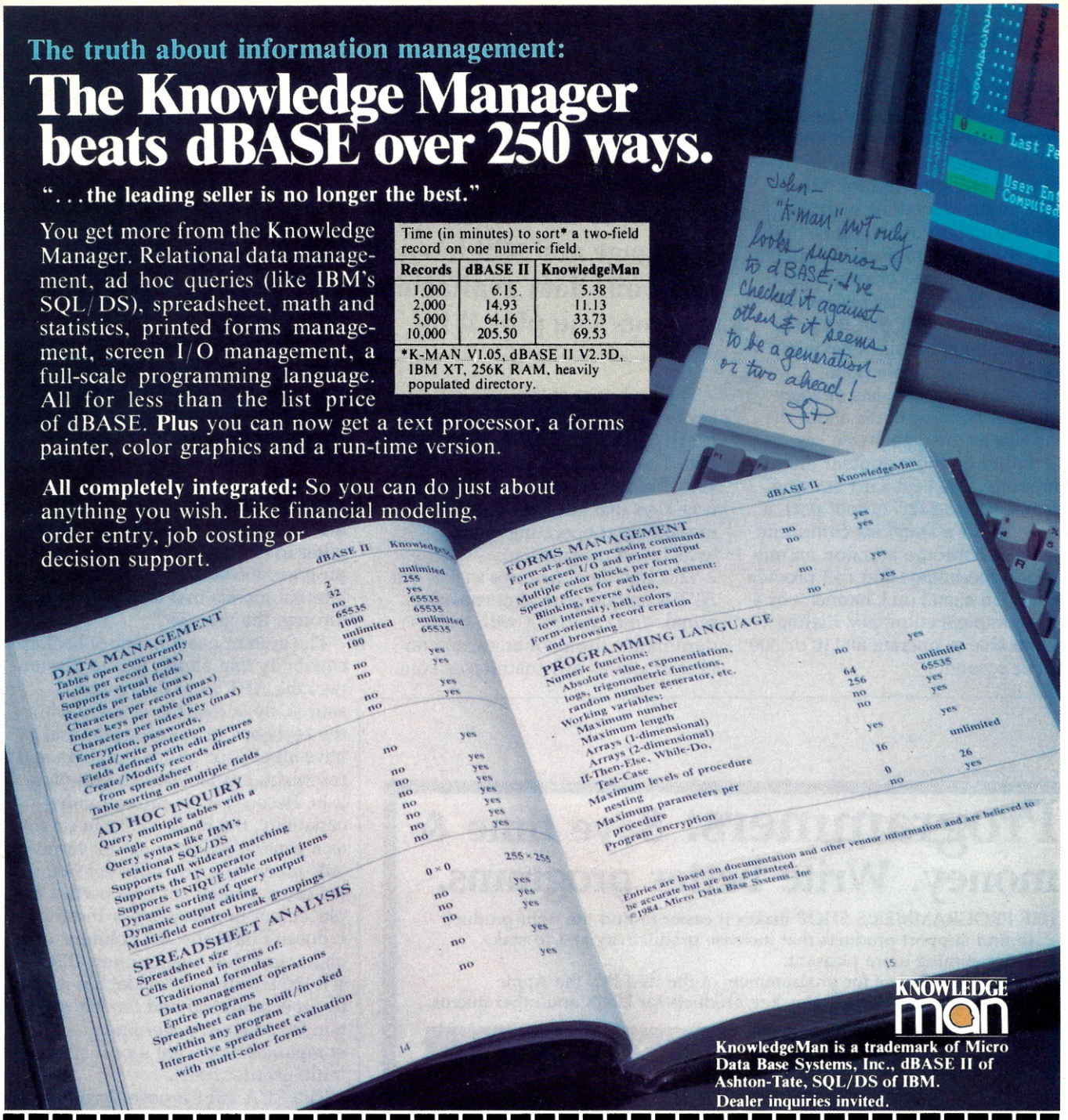

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The RCA APT

I recently had a need to obtain a terminal that could be used both for local communications with an IBM business computer and for telephone communications with the BRS information utility. Since this was a short-term project, I wanted a terminal with a low price but good flexibility. Through my research I found the RCA APT (All Purpose Terminal) that combines flexibility with a very reasonable price.

The RCA APT consists of a keyboard and housing that's about the same size as the detachable keyboard used on most popular microcomputers. The keyboard housing contains an RS-232C output port, a connector for a standard composite video monochrome monitor, an output for a modulator that can provide a television signal on Channel 3 or 4 and a complete automatic dialing modem able to operate at 110 or 300 bits per second.

You can disconnect the APT, fly across the country with the keyboard in your luggage and still have all your data available when you plug it in.

The keyboard of the APT has 58 keys arranged in a standard (Selectric) pattern and a 16-key numeric pad. There are four special function keys, but the keyboard also has two user keys that can set the system into different operating modes (which you program in).

This bundle of features makes the APT a unique general-purpose terminal. You can use it with a standard monochrome monitor to connect to almost any mainframe computer that uses the asynchronous RS-232C communications signaling system with the ASCII data alphabet. You can use it with a monitor or with a television set to communicate with a remote system or an information utility over a dial telephone line using its own internal modem.

Dials Numbers

While the RCA APT can't be programmed to run your favorite spreadsheet or word processing software, it can be programmed to remember and dial your favorite telephone numbers, automatically transmit your identification and sign-on codes and react to commands received from the host computer in certain ways. You can program the system using its own internal menus that lead you through the process.

The system has a memory backup capability that allows you to disconnect the APT from the power source, fly across the country with the keyboard in your luggage and have all of your phone numbers and responses available when you plug it in. Because of its programming capability, the RCA APT can serve as a general replacement for terminals made by many different manufacturers. It may not be a perfect replacement in all cases (for instance, it doesn't have the 132 columns of characters that the common DEC VT-100 terminals provide) but it can be an economical and flexible system for schools, governments or companies that want a cost efficient multi-user terminal.

The RCA All Purpose Terminal has a list price of $498. You can get it with a standard keyboard or with a special membrane keyboard that's spill-proof (also designated as peanut-butter-and-jelly-proof for elementary school students or pizza-proof for high school students). RCA sells a good 12-inch video monitor for $199, but any standard monitor will work with the APT. I found the APT to be loaded with capability for the money. It repackages some old ideas into a new kind of added-value device.□

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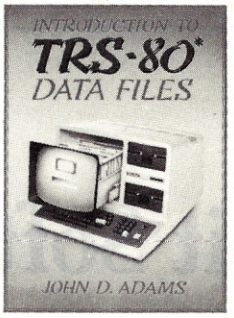

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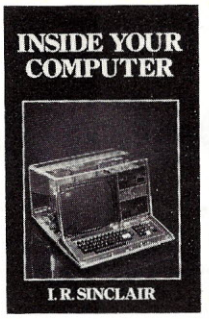

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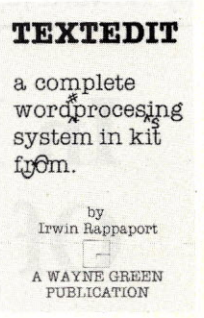

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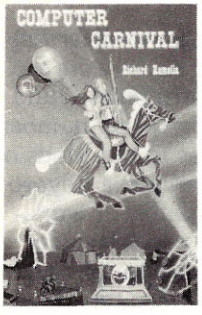

Computer Carnival

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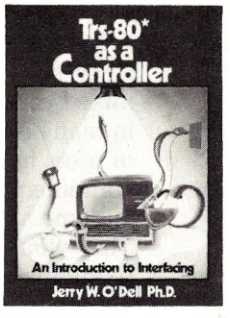

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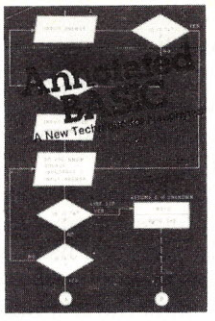

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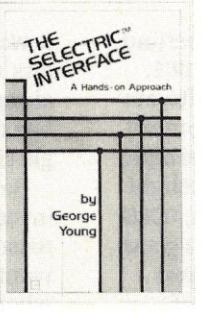

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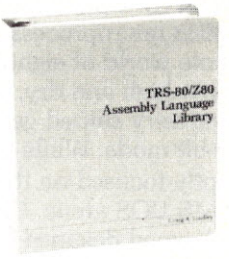

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A> The System Prompt

By Edward Joyce

In Defense Of Eight-Bit Software

Emulators: A Software Solution To Bridging the Gap

When IBM put its weight behind the 8088 microprocessor in 1981, a whole world of eight-bit software was left high and dry. The computing industry shifted gears overnight to 16-bit mode. While the limelight abruptly focused on the 8088, 8086 and MS DOS arena, CP/M-80 products seemed destined for entries in *The Annals of the History of Computing*.

Yet there's a thriving community of eight-bit users out there, including yours truly. Many of us have invested blood, sweat, tears and more money than we care to admit on CP/M-80 programs. And as long as there's an electron or two glowing in the CRT yokes of our Xerox 820s, TRS-80s or Kaypro IIs, we're not about to retire the software.

Salvaging Programs

Someday, though, you'll be faced with mothballing those venerable computers that think in terms of eight bits. After all, electronic components that survive infant mortality eventually succumb to old age. But on the day of reckoning, the software will still be as fresh as the day it was born. Must thousands of dollars worth of programs be junked alongside worn-out hardware that has depreciated to the price of a single-sided disk?

Besides the monetary value of the investment, there are several other reasons why CP/M-80 users may want to transfer their software when they climb the technology ladder to the 16-bit world of CP/M-86 or MS DOS. In shops that run data processing day and night, bringing the operations to a week or month standstill to upgrade software constitutes disaster. If the old CP/M-80 programs could run unchanged on the new 16-bit hardware, then you could later convert the software at a leisurely pace without disrupting daily activities.

A second reason for transferring eight-bit programs is that the CP/M-80 workhorses may simply be unavailable in 16-bit form. This situation was prevalent during the early days of 8088 machines, although the problem has diminished considerably today. Most distributors of the popular eight-bit packages now offer 16-bit versions of their software as well.

The third reason for transferring CP/M-80 programs stems from the mixed varieties of machines found in many offices. A growing number of users have access to two kinds of computers—for example, a Kaypro at home and a Columbia at work. They would like to run the same programs on both machines, which means hopping between the distinct operating systems.

The most common solutions to the problem of executing CP/M-80 software on an 8088-based computer involve extra hardware. The DEC Rainbow and Seequa Chameleon personal computers give you the best of both worlds by embodying 8088 and Z80 processors. Such dual-nature machines host your choice of MS DOS, CP/M-86 or CP/M-80 software.

Microlog Inc. offers another hardware solution. This company builds Z80 add-on cards for IBM PCs and PC-compatible machines. About $700 opens the door to the eight-bit world.

Software to the Rescue

The least expensive solution to keeping eight-bit programs alive in

the 16-bit domain, however, comes from the software side of the fence. For $70, plus documentation costs, you can buy a program that emulates CP/M-80 on a CP/M-86 or MS DOS 8088/8086 system.

Dynamic Microprocessor Associates of New York markets the emulator program, called EM80/86. The 4KB program, delivered on a CP/M-86 or MS DOS 5¼-inch disk, sandwiches itself between the 16-bit operating system and eight-bit software. EM80/86 acts like CP/M-80, and the eight-bit program never knows that it's on foreign turf.

The first step in emulating CP/M-80 programs on an 8088 machine requires transferring the object files to the host system. If both machines use eight-inch or 5¼-inch disks, this task becomes relatively elementary. Under CP/M, the PIP utility transfers files between CP/M-80 and CP/M-86 media. To go from CP/M-80 to MS DOS, you can use one of the commercially available utility transfer packages.

In my case, the transfer wasn't so simple. My CP/M-80 system is a Xerox 820 with eight-inch disk drives. On the other side, I'm running MS DOS on a Columbia VP portable with 5¼-inch drives. Since these drives are not even in the same universe, let alone the same ballpark, I resorted to the transfer devices that transcend the most formidable hardware barriers: the communications ports.

To send files through the communications ports, I invoke the public-domain program, Modem7, on the Xerox. Perfect Link, which comes bundled with the Columbia, handles the communications chores on the receiving end. DMA also markets software that processes data communications. A male-to-male serial communications cable with a null modem in between connects the computers from serial port to serial port. The $29.95 null modem from Radio Shack reverses the signals on the serial cable so the communications programs can handshake as if they were connected through a modem.

With that hardware in place and the communication protocols set to agree in the sending and receiving programs, the machine-to-machine transfer took place without incident. In a short time, I had virtually filled an MS DOS disk on the Columbia with CP/M-80 software from the Xerox.

Emulated programs do deviate significantly from the real McCoy when put to the test of a stopwatch.

To the Rescue

Now EM80/86 steps into the picture. I first fed the emulator the *lingua franca* of personal computers, Microsoft Basic. You initiate the emulator and the CP/M-80 object code by typing the whole shebang along with any parameters on the MS DOS command line. For example, "EM80 MBASIC.COM SIEVE" invokes the EM80/86 emulator to execute Microsoft Basic. Basic will then execute the Sieve program, picking up the filename as a parameter on the command line.

After execution, or I should say emulation, of the object file, EM80/86 doesn't remain in control; instead, it exits to MS DOS. Thus, in the preceding example, typing the Basic command System returns control directly to MS DOS.

When executing object code, EM80/86 supports the lowest common denominator of CP/M-80, the 8080 instruction set. If an attempt is made to execute instructions from the Z80 superset, such as "08" (the operation code for the EX AF, AF' instruction), then the emulated program is terminated with an error message.

The emulator will also terminate programs that perform direct BIOS calls other than warm boot, console I/O and printer output routines. This restriction affects few programs with the exception of disk repair or diagnostic utilities. Since these programs have little value beyond their native systems, the limitation is reasonable.

Beyond those minor restrictions, the emulator supports the lion's share of CP/M software. Of a dozen programs I tried, each ran as expected. The trial balloons included heavyweights like WordStar, Multiplan, Pascal/MT+ and the Mac assembler.

The only problem that surfaced involved display nuances. Initially, the CP/M-80 version of WordStar that I ran on the Columbia displayed highlighted messages that appeared as some yet-to-be-decoded form of hieroglyphics. Worse than that, CP/M-80 Multiplan stopped dead in its tracks after displaying the sign-on message.

After a few minutes of head scratching, I traced the problem to the terminal configuration. WordStar, as configured for the Xerox, turns on the high-order bit to display a character in inverse video. The emulator program, in the words of the user's manual, "passes nondisplayable character codes to the console display routines, including those whose high bit is on. All of these codes will display some special character on the screen." Furthermore, the console logic of EM80/86 emulates a Lear Siegler ADM-3A terminal.

With that bit of wisdom tucked under my hat, I reinstalled WordStar and Multiplan, disabling the high-order bit method of invoking inverse video and configuring for an ADM-3A terminal. After that, the programs' screen displays mirrored their CP/M-80 counterparts.

Emulator Performance

While emulated programs do a good job of functionally masquerading their original incarnations,

they do deviate significantly from the real McCoy when put to the test of a stopwatch. My benchmark tests ran at speeds that were 12 to 1.2 times greater on the 4.77 MHz 8088-based Columbia than on the 2.5 MHz Z80-based Xerox. These figures reflect emulator execution under MS DOS version 2.0.

Dynamic Microprocessor Associates predicts that performance will vary according to the proportion of time spent performing input and output. As input/output increases, the emulated speed decreases. The tests I ran fit this pattern. Copying a 14KB file on the Xerox using the PIP utility takes 17 seconds. This same PIP operation under EM80/86 clocks in at 21 seconds, not too shabby for an emulator. It appears to be benefiting from MS DOS's streamlined input/output.

However, some processor-intensive operations post times only a notch above an abacus. For example, one iteration of the Sieve of Eratosthenes benchmark in interpretive Basic on the Xerox requires 238 seconds. EM80/86 tips the scales at a hefty 2960 seconds for the same code. Although this is a "worst case scenario" consisting of an 8080 interpreter interpreting a Basic interpreter, it illustrates the cumulative degradation attributable to emulation.

The emulator overhead also surfaces in intense interactive programs, such as word processors. WordStar performs in slow motion, which can be somewhat educational for watching each screen field being updated individually, but the net effect tends to disturb your keyboard *modus operandi* since what's being displayed is always several characters behind what you're typing.

In general, I'd recommend the emulator for batch programs that run with little or no operator interaction. For programs that are expected to react immediately to the operator's keystrokes, the slow response often exceeds your conditioned attention span. Where response time is critical, I would opt for a 16-bit native code implementation of the software or a hardware solution, such as the Z80 coprocessors mentioned earlier.

CP/M-86, MS DOS Connection

The developers of EM80/86 offer two other products that round out emulation on an 8088/8086 processor. CONVCP executes CP/M-86 programs under the MS DOS operating system. Conversely, CONVMS executes MS DOS programs under the CP/M-86 operating system. These programs are called converters instead of emulators since they only convert system function calls rather than emulating each instruction. The execution times rival the speed of the original environment.

These products also include utilities for reading object code files from the foreign operating system disk. The filenames may be specified using wild cards, so multiple files may be copied with one command.

Dynamic Microprocessor Associates states that its 8086 O.S. Converter package runs Microsoft Basic and Fortran, Digital Research Pascal and utilities like the Microsoft Assembler and Linker. I didn't have the opportunity to extensively test these or other programs, but the documentation reveals that the level of compatibility would be less than the full CP/M-80 emulation achieved under EM80/86.

Since CP/M-86 and MS DOS are largely a superset of CP/M-80, constructing a CP/M-80 environment within those operating systems is relatively straightforward. Simulating CP/M-86 or MS DOS is a different story, though, because a handful of system function calls are unique to each system. The documentation lists a handful of unsupported function calls in each conversion program. Most of these fall into the trivial class, such as lack of a write protect disk call when CP/M-86 programs are executed under CONVCP, the MS DOS converter.

Overall, EM80/86, CONVCP and CONVMS bridge the wide canyons isolating the distinct eight-bit and 16-bit operating systems. These products expand the horizons and life spans of programs that were originally written for a specific configuration. Emulation of instruction sets and operating systems hardly sets new records for blazing speed, but, nonetheless, you have an inexpensive alternative to buying new hardware and software.

CONVCP and CONVMS will face new competition if Digital Research is successful with its Concurrent PC DOS package. Concurrent PC DOS will run both PC DOS and CP/M-86 software simultaneously, a capability that plugs the gaps formerly filled by O.S. Converter programs. In the eight-bit arena, however, EM80/86 still remains a one-of-a-kind product. Competing hardware devices cost at least ten times as much. At $70, you can't go wrong.□

Address correspondence to Edward Joyce, Route 9, Box 149, Charlottesville, VA 22901.

A Capsule Look at EM80/86, CONVCP And CONVMS

Manufacturer
Dynamic Microprocessor Associates
545 Fifth Ave.
New York, NY 10017

Price
EM80/86—$70.
CONVCP—$70.
CONVMS—$70.
Documentation—$45 (covers EM80/86, CONVCP, CONVMS).

Standard Features
EM80/86—executes CP/M-80 programs in a CP/M-86 or MS DOS operating environment.
CONVCP—executes CP/M-86 programs in an MS DOS operating environment.
CONVMS—executes MS DOS programs in a CP/M-86 operating environment.

Documentation
35-page IBM-sized user's manual.

Circle 44 on Reader Service card.

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DMA products operate on Z80, 8086, 8088 processors, including the IBM-PC

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ASCOM™ is the most versatile asynchronous communication package for microcomputers on the market. It features interactive, menu-driven, and batch operations; supports auto-answer and auto-dial modems; includes most popular protocols; provides network simulation; and many other options. Xerox Corporation, NCR, Monroe Systems for Business, and the big 8 accounting firms use ASCOM™.

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EM80/86™

This software emulator lets you use eight bit software on sixteen bit microcomputers without hardware modifications.

The 8086 O.S. Converter™

CP to MS—Permits execution of Digital Research's CP/M-86 programs under Microsoft's MSDOS (or PCDOS).

MS to CP—Permits execution of MSDOS programs under CP/M-86.

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This package of user-friendly utilities for the IBM Personal Computer and similar systems includes copying, directory sorting, patching, and a general purpose file print utility.

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The Database Manager

By Shawn Bryan

A Trip Down Database Lane

Five New DBs; KnowledgeMan Gets a Face-Lift

This month I'll take another excursion into database management programs. Metafile, Salvo, RL-1, Nutshell and VersaForm head up the reviews. While I'm sightseeing, dB/RA, an add-on for dBase II, is also worth a look.

The programs I've already reviewed in this column are in flux. GMS Systems (Power-base) and Software Solutions (Dataease) have both announced major revisions to their already capable programs. I've been promised review copies as soon as they're available and will let you know the kind of new entertainment they serve up. I've also just received KGraph and KPaint, two add-ons for the KnowledgeMan program that immensely improve the view you get when working with the program. You could say they offer up a visual feast for sore eyes. All this frantic activity is just one more indication of how hot the database market really is.

Integrated continues to be the watchword for database management software. New integrated and integrational packages are announced weekly. Some are advertised for months with nothing to show but pretty advertising photos. This phantom software is a real bust. Numerous phone calls to the manufacturers bring promises and nothing more. Meanwhile, people send in orders and checks and receive nothing in return. At times I wish Lotus hadn't started this whole media thing. Perhaps a regulation requiring companies to publish a put-up or shut-up date with their ads should be required. At least then, we'd get some peace and quiet since most companies never make the put-up dates.

Metafile

One company that *has* had a product for some time is Sensor-based Systems of Rochester, MN. In fact, its program, Metafile, was one of the first integrated packages available for the IBM PC. The latest version, 7.0, offers a few enhancements but really just polishes the act it has ably put on since it was first introduced.

Metafile combines a good database manager with a fair text editor and impossible communications. It's faster than dBase II and much easier to use. It's also more powerful, although that's debatable.

Set Apart

What sets Metafile apart is that it integrates a text editor with a database manager. The text editor isn't a word processor, but you can create form letters and other straightforward correspondence with it. What makes it most useful is that you can embed Metafile commands and formula in a text file and then run the text file. The database program is called into action as required to accomplish commands you set forth or to evaluate and act upon a formula. Merging a letter with the database results in swift and accurate transfer of data-like names and addresses, balances due, inventory order amounts and so on from the database to the letter.

Metafile also pioneered in windows. Here is a program that used windows long before windows became *de rigeur*. The Metafile Assistant, so called, appears in a window when you start Metafile. The Assis-

tant is actually a menu of the commands available in Metafile. If you're a bit rusty using Metafile, or just learning, then the Assistant is there to assist you in remembering the command syntax. If you're an expert operator of Metafile, the Assistant can be turned off, but it remains only a keystroke away if you do get in trouble.

The window can also be used to utilize the Lookaside feature, a very useful addition to any database management program. Lookaside opens a window to the program and puts what you're doing on hold. The file you're working on remains on the screen, but it's placed in the window. From this window, you can invoke the various Metafile commands to do something else and, when you've finished, you're returned to where you were in the other file. This creates a multitasking effect, although you're really only doing one task at a time. Still, it's very helpful to be able to go look up a date or an address in the database when working with a letter.

Demo Disk

Metafile has a most effective demo disk that shows the program in action. This demo disk is the real program limited to 25 records. The demonstration disk includes a self-running demo program as well as a completely free-standing version of the program that's limited to 25 records of data. You can give Metafile a good workout before you purchase it to see if it's to your liking. This marketing technique is fair to both manufacturer and consumer and should be copied by others in this business.

Discussing this demo version points out one of the quirks of Metafile. The Metafile disk isn't copy protected. You can make as many backups as you feel you need. Metafile comes with a hardware lock that makes the program worthless on any other computer, however. This lock must be attached to the serial port on your computer. If you don't have one, you won't be able to use Metafile. The device doesn't disable your serial port and has a connector for attaching your modem to the computer. The program regularly looks to see if the device is present so you can't put it on a machine, start up Metafile and then take it to the next machine to do the same thing. Any copy of Metafile used without the lock will be limited to 25 records, just like the demo.

The problem with this scheme is the serial port requirement and the disconcerting effect the program has on my Hayes modem when it's configured for Crosstalk. As soon as I bring up Metafile, it captures the modem and opens the telephone line. To get it to quit, I have to turn the modem off or reset its switches. That's not particularly troublesome for me because I have an external modem, but it could be a real problem for someone with an internal modem.

Command Language

The Metafile command language permits the creation of procedure files, much like those used by KnowledgeMan and dBase II. Procedure files are programs just as much as programs written in Basic or Fortran are. They permit you to design and build systems with Metafile. In addition to the usual commands, like if. . . else and while. . . end, Metafile has some commands not found in any other program with which I'm familiar.

Animate causes frames of text to advance automatically, much like the old movies used to flicker by, only at a much slower and more controllable pace. The speed with which the frames move is controlled by the Pace command. If you're reviewing a long series of tables, the Animate command will step you through them automatically.

Itemize causes Metafile to display record information in row format, and the List command displays information in columnar report format.

You can position yourself in Metafile's files with a series of commands. First, Last, Next and Previous all bring you to the next record

in the indicated direction. The Position command takes you to the specific numeric record. You may key a field for faster record retrieval.

Probably the best use of Metafile is as a forms processing system where a large number of records are involved. In this situation, the text editor (used as a forms processor) coupled with a very powerful and flexible database manager make an ideal pair.

Poor Points

What are Metafile's shortcomings? First, the printer support is poor for such a powerful package. As far as I can tell, serial printers aren't supported at all. The documentation says very little about printers. Parallel printers like the Epson, NEC and Data Products are the only ones specifically supported.

The communications need to be better explained. Metafile does have a built-in communications capability, but the manual offers a single page on how to use it. Further, it appears to work only with other Metafile programs. That will make data transfer between Metafile users easy, but what about the rest of the world?

Finally, I can't get excited about the hardware lock used by Metafile. If you don't have a serial port (and I suppose there must be someone who doesn't), then you have to buy one, on top of spending $995 for Metafile. That makes Metafile one of the most expensive commercially available database programs. I'm not sure it's that good!

The documentation for Metafile still needs some work. The two-volume tutorial and practice manual is done reasonably well. The reference manual isn't. Things are left out, and the arrangement isn't logical.

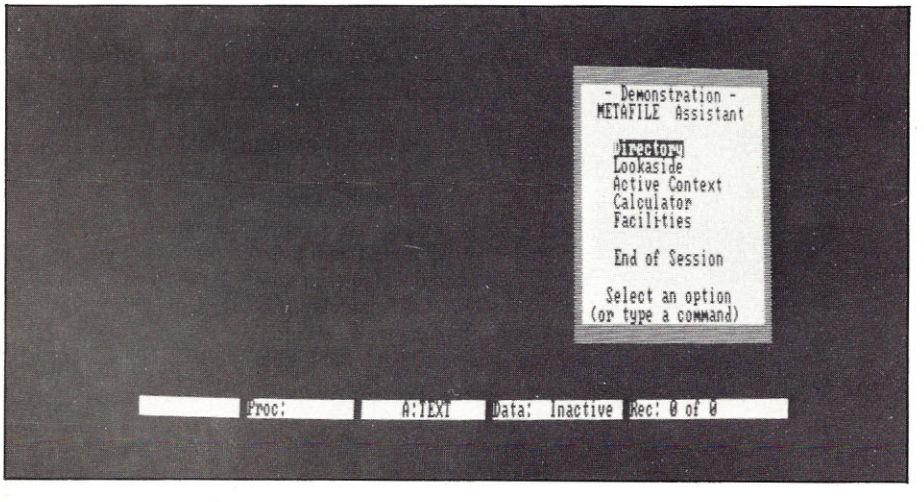
To try to ease the fear many office people have of computers, VersaForm pretends *not* to be a database.

The bottom line is that Metafile has a lot to offer, but it also should improve its act. It's a very expensive product in this day of dropping prices and improved performance.

As a postscript, I received a phone call from a spokeswoman at Sensor-based Systems the same day I submitted this column to *Microcomputing*. The call informed me that version 8.0 of Metafile will soon be on its way to me. I discussed my comments in this review with the spokeswoman, and she felt I had been fair with the "old" Metafile. She proceeded to fill me in on version 8.0.

Version 8.0 has entirely new documentation. It's modeled after the IBM documentation used by many other manufacturers. She assured me the content has been much improved. Metafile has also been updated and now supports networked PCs as part of its communications protocol. Printer support has been expanded to include serial printers, and other enhancements have been promised as well.

It sounds as if Metafile may be a better buy now than it was before. It's still expensive, but it makes a very good business database management system. I'll fill you in on version 8.0 when it arrives.



Metafile's Assistant stands ready to help at any time.

Salvo

Fourth generation computer programs are now being advertised. The first question I asked when I read the ads for Salvo, a "fourth generation relational database management program," was "What is a fourth generation language?"

Fourth Generation

I quickly discovered that definitions here are a matter of individual interpretation but that fourth generation meant "smart software" to my mainframe DP friends. That is, these languages and programs have an ability to learn by doing and a vocabulary of English verbs that can be used to construct sentence-like commands.

Another term that's used is nonprocedural. To be a fourth generation language in the programmers' argot means that instead of defining a procedure to achieve an end, you define the end and let the program define the procedure. Salvo meets at least some of the criteria as a fourth generation language. After creating the file structure for your database(s), Salvo permits data retrieval by two primary methods.

Salvo lets you request information in "natural language." You aren't bound by rigid syntactical requirements when you make a request of the program in the natural language mode. The program reads your request and sorts out the sentence

structure into syntax the computer can use. This translation is transparent to you as the user, but the end result, a computer language request, can be viewed and modified if it doesn't do what you want it to do. This makes it easy to modify programs and makes a good learning tool for someone getting started with the program. By viewing the actual computer language request created by the computer, you quickly get a feel for programming Salvo directly.

If you aren't ready for the natural language request, Salvo has an autorequest function that is even easier to use.

The autorequest feature uses a unique graphic view of your database to walk you through the creation of a report. The files you select appear as boxes on the screen, much like an organizational chart for a business. The relationship of each file to the others is portrayed graphically.

If a file has a one-to-many relationship, then the many are shown below the one. If the file is one of many (that is, subordinate to another file), then it's shown below the file to which it's subordinate. The other possible relationship, many to many, shows up with the files related on the same plane or at the same level.

You select the fields you wish to work with by moving the cursor from file to file and pressing the enter key to select the desired files. As selections are made, Salvo generates a computer request. You need to know nothing about relations or selection criteria.

Casting Stones

Salvo is not without fault. The program isn't particularly fast once a request has been made. It also requires a great deal of room on disk—more than a source of frustration. The documentation with the program doesn't clearly spell out the fact that Salvo must have two disks to work. I almost erased the sample files disk to start my review before I realized that part of the Salvo program also lives on the data disk. You cannot run Salvo with a blank, formatted data disk.

Salvo has a procedural or command language you can use to create programs. The version of Salvo now available has many missing commands. Software Automation intends to make these commands available in the final production version of Salvo.

Written reports aren't yet well-documented. Getting data to paper in all but the most basic fashion is too complicated. The reporting section needs to be much enhanced if it's to be valuable for creating written reports.

Still, even with these problems you'll like much about Salvo. It clearly has some features that make it technically interesting and practically promising. The key to the survival of Salvo will be Software Automation's ability to bring to full fruition the promising ideas and concepts presented in the Salvo manual.

dB/RA

Gryphon Microproducts of Silver Springs, MD, is a software firm specializing in dBase II add-ons. dB/RA is a new release from Gryphon that, you guessed it, modifies the array capabilities of dBase II.

For those not familiar with dBase II's limitation, only 63 memory variables are permitted in the stock version. This limitation has been a source of consternation and frustration for many programmers and has resulted in many ingenious tricks that get around the problem. It has also meant the creation of many extra lines of convoluted code to call and release memory variables in programs requiring the use of more than 63 memory variables.

Why use memory variables? One primary reason is speed. By creating an array of information that resides in memory rather than on disk, the contents of that array (or database within a database) can be accessed much faster.

Another reason for using arrays is to get around the two-file limitation of dBase II. Properly structured, an array can act like a third or fourth database, giving you the ability to work with more than two files at once.

Cubbyholes

dB/RA is a machine language routine that's loaded into memory with dBase II. It doesn't modify the program on disk. Where dBase II permits 63 memory variables, or cubbyholes into which you can place data, dB/RA permits up to ten arrays of one, two or three dimensions.

What this means is that, if you have enough memory, you can have up to ten arrays each using 64KB. Each array can be a one-, two- or three-dimensional list. A one-dimensional array can be compared to a single column of information. An example of a two-dimensional array is a spreadsheet where information is presented and saved in columns and rows. One of the new three-dimensional spreadsheets demonstrates a three-dimensional array. On a 3-D spreadsheet, information is saved in columns, rows and on pages. To locate a specific cell, you give the coordinates (A1) and the page number. A ten-year calendar would be dimensioned 12, 31, 10—12 for months, 31 for days and ten for years.

Once the array has been dimensioned, putting information into it and getting it out is a matter of calling up the right cubbyhole. Since the information is all in memory, no disk access is required and response is almost instantaneous. The only caution is that you must save information you put into an array before you shut down the computer if you don't want to lose it.

dB/RA sells for $200 and is available directly from Gryphon. It's the kind of program not everyone needs, but if you're programming systems of any size in dBase II, it's the kind of add-on that makes large programs run at acceptable speeds and gives you the flexibility of having more than two files available at once. You also gain the advantage of being able to use up to three-dimensional arrays.

The version of dB/RA I received was accompanied by preliminary documentation. The appendixes were not yet complete, but Gryphon plans to offer sample programs, a vocabulary section and an index on the sale version. The documentation

fits the dBase II manual and consists of 18 concise pages. I think dB/RA is worth considering, and I think you'll agree.

VersaForm

VersaForm is a business forms processor. The whole idea behind VersaForm is form related. The people at Applied Software Technology realized that almost everything done in an office is forms related. Why not, they reasoned, create a program that mimics the familiar forms people have to work with? With that key thought, VersaForm had its beginnings.

To try to ease the fear many office people have of computers, VersaForm pretends not to be a database. It makes it very easy for you to copy your existing forms onto the electronic screen. The process of forms creation is menu-driven, as are the other facets of this program. If you don't want to copy your own forms or don't want to try to create the screens necessary for data entry, Applied Software Technology will sell you forms that are already done.

Create a Form

Form creation begins with a blank screen. You type text on the screen where you want it to appear, just as you would with a typewriter. Single items, as they're called in VersaForm, are the field prompts and consist of the prompt text followed by a row of dots. The dots signify the field length. The prompt must be separated from the field by at least one space. If you forget to leave the space, VersaForm corrects your error for you. Other possible errors are also trapped by the program.

When the form has been entered and saved, data entry can be simply a fill-in-the-blanks exercise in drudgery. Many times, though, you want to edit data as it's entered. Clearly, it would be nice if the program could prevent the entry of letters in a numeric field and so on. VersaForm does permit the creation of edit masks and more. The system date can be retrieved automatically to save typing. Fields can be justified either left or right. A yes or no field can be so specified, as can a mandatory entry field. If an entry must be within a range to be acceptable, the program will check that. If there is a special format to the entry, like two letters followed by a dash and three numbers, that can be specified. Data entry is protected from inadvertent errors.

As with most forms kept in an office, the reason you keep them is to save data for later reports. VersaForm has extensive reporting capabilities. Columnar reports are easily created. You simply specify which data items to print. If you wish to print data out on preprinted forms, VersaForm excels at getting the information where it belongs. Place a copy of your form in the printer and register it with a known spot, like the top of the form. VersaForm will print columns and rows of numbers all over the form. Use these numbers as a grid system to locate the places on the form where data items should print. Tell VersaForm what those grid coordinates are and what fields print in them, and you're ready to print from your database to preprinted forms. I like this feature a lot. It's easy to understand and use.

Print It

VersaForm provides the usual report selection criteria so that only the forms you want to print are printed. You can get a list of all the delinquent accounts printed on your nasty letter form, or you can put the whole nasty letter into the program with a place to print the names and addresses and amount due. It will look as if you wrote it yourself.

Another nice feature of VersaForm is the built-in calculator. I found it handy. Often, when filling out invoices or order forms, you need to do a little manual calculation. VersaForm has provided a calculator in the program so you can make a little more room on your desk by discarding the old calculator you've been using.

The VersaForm documentation isn't impressive-looking, but it gets the job done. You receive a box in which you'll find a spiral-bound manual, a few loose addenda sheets and a disk. The disk isn't copy protected, so making a backup is straightforward. The manual has adequate instructions and a nice tutorial. VersaForm deserves your attention if forms are getting you down.

As a postscript of sorts, Applied Software Technology has announced that VersaForm XL will be available soon. This enhanced version will permit concurrent use of more than one file. It looks like a good product will get even better.

Nutshell

I just received the release copy of Nutshell, a new database manager from Leading Edge. The documentation is Xerox copies of what will be in the binder when printed. I'm impressed! Look at the specs in Table 1.

Clearly, this is no ordinary beast. In addition to the unlimited capabilities detailed in the table, Nutshell also has great graphics, superb forms painting, full color support and it's fast. It requires 256KB of RAM and supports floppy or hard disks. Every word in every record is indexed. No longer do you have to remember the spelling or the place or the time. Any word you can remember will be found if it was used.

I was hoping to have the manual to look at by now, but I can see enough of the manual in the copies I have to be assured that the final product will be a success. Nutshell appears to be a very polished performance. I'll have a full review of it next month.

RL-1

RL-1 is a program that's been around for some time now. There was a flurry of ads for it about a year ago, but I haven't seen any for some time. I called, and the company is still turning out this quality, but sophisticated, product. RL-1 is a programmer's dream. It has built-in interfaces for Pascal, Basic, Cobol, Fortran and Macro. You can place the kernal of this program in an applications program you are doing in one of these languages and save yourself a lot of programming time.

RL-1 is a fully relational database

management program. It permits unlimited relations. Each relation may have up to 65,535 records and each record may have up to 1023 characters. RL-1 has a complete command language for programming applications, and ad hoc queries are possible. Application packs for RL-1, spanning the range of normal file-related activities, are available, including general ledger, inventory, accounts payable and receivable and so on. RL-1 is a natural programming tool.

RL-1 requires at least 96KB under MS DOS and is best used with two floppies or a fixed disk. It doesn't take up much room and is written in assembly and distributed in object code, so it runs very fast. It may not be as well-known as some, and it may not be as easy to use as many, but RL-1 is a programmer's friend and can be used by nonprogrammers who are willing to spend some time learning the system.

Other Happenings

Innovative Software has announced its answer to Ashton-Tate's Framework and Lotus's Symphony. It's a series of programs called Smart Software. The package of three will sell for $895 and include the Smart Data Manager, the Smart Spreadsheet and the Smart Word Processor. Of interest are the support for the 8087 coprocessor that will be built in and windows. The data manager appears to have some nice features and will be a step or two above TIM IV, Innovative's current release.

ADI America has coined a new phrase: integrational. Its database manager, being imported from West Germany, is Aladin. It sounds like a real powerhouse, supporting up to 16MB files, variable length records, virtual memory and more. We'll see. . .

Ashton-Tate has quietly released an upgrade to the 2.4 version of dBase II. It isn't a major upgrade but does have some improvements, including a lot of corrected bugs. The key improvement is that sorts are speeded up tremendously. Look for version 2.41 when shopping for dBase II. If you want to upgrade, it will cost you $75, a bit steep for a modest improvement and fixed bugs. Since versions 2.5 and 2.6 are in the works, you may want to wait for them and skip 2.41.

What's up next month? KnowIT, Nutshell and DataFlex are waiting for me to get to them. So is TIM IV. Keep the letters coming so I know what you want to see. I'll try to answer them all. I'd appreciate it if you'd use electronic mail if at all possible (either The Source, CompuServe or MCI Mail). It'll make cataloging your letters and questions faster and easier, and I'll be able to get your replies to you faster.

Also next month, I'll be taking a look at a new use for database management and a new class of program. Think Tank and Thor are both called thought processors (Orwellian, isn't it?). I'll take a look at how useful processed thoughts are and how well these programs perform as imitators of the most powerful databanks, our own minds. See you then!□

Nutshell

Fields per record	60,000
Key fields	All fields
Characters per field	16,000,000
Characters per record	16,000,000
Records per file	2,000,000,000
Reports per file	60,000
Lines per header and footer	65,000 lines max

Table 1. Nutshell specifications.

	Metafile	RL-1	Salvo	VersaForm
Max field size	64,000 text 235 data	1023	1020	78
Max record size in characters	1000	Memory*	1020	4000 bytes
Files open concurrently	5	Memory*	16	1
Color?	No	No	Yes	No
Disk drives required	2	1	2	2
Screen oriented?	Yes	Yes	Yes	Yes
Menu-driven?	Optional	No	Yes	Yes
Ease of use	Good	Poor	Good	Good
Documentation	Fair	Fair	Fair	Good
Performance	Good	Good	Fair	Good
Copy protected?	Yes **	No	Yes	No
Price	$995	$495	$495	$389

*No theoretical limits. Memory limits control.

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Table 2. Comparison table.

Products Reviewed

Metafile
Sensor-based Systems
40 Sixteenth St. SE
Rochester, MN 55904

Salvo
Software Automation Inc.
14333 Proton Road
Dallas, TX 75234

RL-1
ABW Corp.
PO Box 1047
Ann Arbor, MI 48106

dB/RA
Gryphon Microproducts
PO Box 6543
Silver Spring, MD 20906

VersaForm
Applied Software Technology
170 Knowles Drive
Los Gatos, CA 95030

Address correspondence to Shawn Bryan, Datatek, Montpelier Junction, Box 4500, Montpelier, VT 05602. Contact Shawn on The Source: BBP681; CompuServe: 71535, 1774; or MCI Mail: SBRYAN.

The Unix Pipeline

By Phil Hughes

Hierarchies—The Unix Chain of Command

File Navigation: Three Utilities Help Point the Way

Editor's note: To avoid ambiguity, commands, filenames and directories have been italicized.

Probably the two most important features of Unix are its hierarchical file system and the shell. Last month, I introduced the shell. This month I'll explain the file system and the use of three file-related commands: *ls*, *pwd* and *cd*. Last but not least, I have some exciting announcements about new computers that run Unix.

The content of future columns will be based on your input. If you have a question about some facet of Unix or a Unix-related product, drop me a line.

The Hierarchical File System

The file system allows you to assign a name to a collection of information and retrieve that same information using the assigned name. The filenames that you assign appear in what is called a file directory. In many operating systems, all files are in one directory. If you're the only user and have only a few files, this works well, but as soon as you either share the system with others or have a large number of files, one or both of two problems occur:

1. Your filenames conflict with those of another user.
2. The file list becomes unmanageably long.

Unix allows and even encourages multiple directories. Each user is assigned a separate directory. You are allowed to create as many additional directories as you need. This allows you to group files that logically belong together into a single directory.

If you're thinking that instead of having one directory of unmanageable size, you now have an unmanageable number of directories of manageable size—don't worry. The file system is hierarchical; directories are linked into a hierarchy rather than being lumped together.

Locating Errors

As an example of a hierarchy, think of how this magazine is organized. Within each issue are multiple articles. Each article is divided into sections that are in turn divided into paragraphs, sentences, words and letters. If you wanted to tell someone that there's a misprint (let's say one letter was incorrect), you'd probably say that the third letter of the second word of sentence two of paragraph four of the topic Parambulator Maintenance in the article "The Advantages of Using Parambulators" in the August 1984 issue of *Microcomputing* was in error, rather than saying the 1,237,432nd character of the issue was in error.

The hierarchical file system in Unix works similarly. With some default conventions and shorthand, the locations of common files may be specified in few characters. Let's look at a sample Unix file system in Fig. 1.

At the top of the hierarchy is what's called the root directory (named */*). This is equivalent to the name of the magazine in the example above. All files are specified by how they relate to this directory. Under the root directory is a directory named *usr*. In this directory are the directories: *bill*, *jan*, *mary* and *phil*. These directories (*bill*, *jan*,. . .) are the home directories of each of the users of this system. This location for the home directories is only customary; they can be set up in

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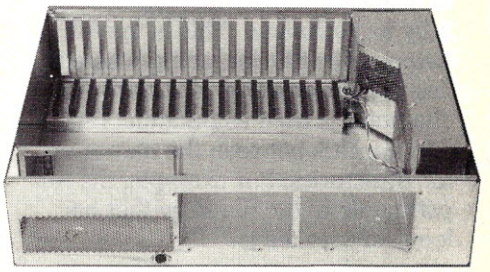

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any way desired by the system administrator. I'll stick to the customary scheme for this explanation.

A Few Terms

Before I detail the concept of a home directory, let me define a few more terms. First, when you want to access a file in Unix, you specify it by its pathname. This is the full name of the file, including where it lies in the hierarchy. The slash (/) character is used as punctuation and appears between the names of the directories. For example, the full pathname of the file *story* that belongs to user *bill* is

/usr/bill/story

Note that a full pathname will always begin with a slash (/) representing the root directory.

The pathname becomes cumbersome so Unix has a method that allows you to abbreviate. This abbreviation is based on what is called your current directory. You can set your current directory with a command and then use it as a reference point when you ask the system to locate a file. This brings me back to the concept of a home directory. Your home directory is specified in your password file entry. When you sign on, your current directory is set to your home directory. Therefore, when Bill signed on, his current directory was set to

/usr/bill

and he could have referenced his file *story* by just using the filename

story

The system knows whether you're specifying a full pathname or a name relative to your current directory by checking the first character of the name you specify. If it's a slash (/), then it means a full pathname follows. Otherwise, the name specified is to be appended to the name of your current directory. Or, as I have my secretary repeat every morning, "Slash means go to the top of the hierarchy."

That's all there is to the hierarchical file system. Let me discuss a few of the other directories in Fig. 1, and then I'll look at three utilities that help you move around in the file hierarchy.

Directory Assistance

The file */unix*, in case you haven't guessed, is the disk copy of the operating system. When you boot the system, this is what is loaded.

The directories */bin* and */usr/bin* contain all of the utility programs, such as *pr*, *cat* and *ed*. The directory */tmp* is where most temporary files are stored. This temporary space is used by the editor, compilers and sort utility, among others.

The directory */dev* is different from the others. The files in this directory are called special files. They are the devices on the system, such as the disk, printer and terminals. If you write to one of these files, you send information to that physical device.

For example, the command

cat test >/dev/console

will send the contents of the file test in your current directory to the operator's console. Generally, file permissions are set so that you can only write where you're supposed to, but be careful writing to the disks (*/dev/cd02* and */dev/fd0* in the figure) as this could corrupt the file system.

The file */dev/tty* is the name of your terminal. Your terminal has another name (*/dev/tty01*, */dev/tty02*, . . .) depending on what physical port it's connected to, but the filename */dev/tty* can always be used to refer to it.

File System Utilities

The three utilities *cd*, *ls* and *pwd* enable you to get around in the file hierarchy and know where you are. The most basic is *pwd* (print working directory). The command has no options or arguments. In other words, the only thing you enter is

pwd

The system responds with the pathname of your current directory. For example, when I enter *pwd*, the system responds with

/usr/phil/articles/mc_ column

The *cd* command is almost as simple. *cd* stands for change directory. It changes your current directory to the one specified as an argument. For example, if I enter

cd /usr/phil/junk

my current directory is changed to my subdirectory *junk*.

Now for the tricky stuff. First, if you don't specify an argument to *cd*, then your directory is changed to

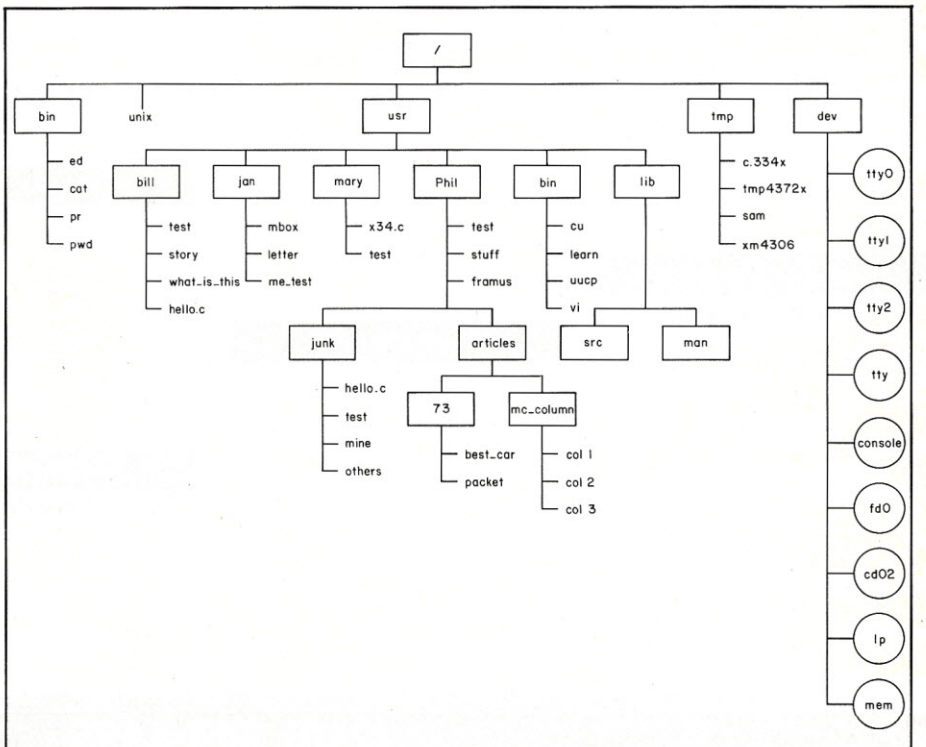

Fig. 1. Typical Unix file system. Rectangles represent directories; circles are special files.

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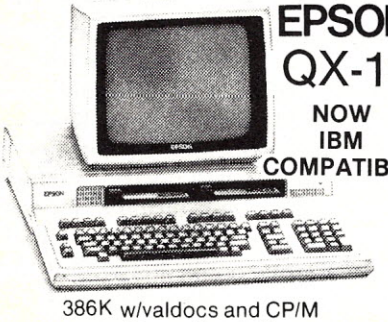

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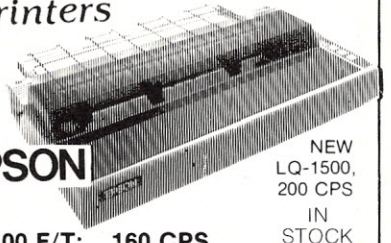

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your home directory. Second, the special character sequence . . is a name for the owner of the current directory (the directory from which the current directory branches). Therefore, if my current directory is

/usr/phil/articles/mc_ column

and I enter the command

cd . .

my current directory becomes

/usr/phil/articles

If I now wanted to change directories back to

/usr/phil/articles/mc_ column

I could just enter the command

cd mc_ column

This works because if I don't specify a full pathname (no leading slash), the name is appended to the name of the current directory.

Finally, let's look at the *ls* command. *ls* lists the contents of directories. Its complete syntax is given in Table 1. Here I am going to describe the basic command and the common options, *-a* and *-l*.

If I am the Phil you see in Fig. 1, if my current directory is my home directory and if I enter the command *ls*, the system will respond with

articles framus junk stuff test

This is a list of all the files in my home directory. Two of these files, *articles* and *junk*, are actually directories, but in the output of *ls*, no distinction is made.

If the *ln* command doesn't make sense, don't panic. Few Unix users know what this means or actually care.

You can pass filenames to *ls* as arguments for selective output. For example, entering *ls framus* causes *ls* to print out only the filename *framus*. This is because only this one file matches the selection criteria.

If I enter the command *ls junk*, the contents of the directory *junk* will be listed, in this case

hello.c mine others test

This happens because all these files match the selection criteria; each one has a name of *junk/. .* based on the current directory. By the careful use of selection criteria using wild cards (remember * and ? from a previous column?), you can get *ls* to list the set of files you're interested in.

Normally *ls* doesn't list files whose names begin with a period. This is so you have a way to hide files that you normally don't care about. The first two files with names like this are the special names for your current directory (.) and the owner of your current directory (..). Another file that generally exists in your home directory is either *.profile* for Bourne shell users or *.login* for C shell users. These files are scripts used by the shell at log-in time to set up various parameters, such as your terminal type. If Phil in Fig. 1 enters the command *ls -a* while he is in his home directory, he will get the following result

. articles junk test
.. framus stuff

Looking at Options

Now let's look at the *-l* option. The *l* stands for long and this option gives you much more information about each file than just its name. Table 2 shows a sample output from Phil executing the *ls -l* command when he is in his home directory. The first line indicates the number of 512-byte blocks assigned to everything listed. This count only includes files and directories that appear in the listing. Files that are in the listed directories aren't included.

The following five lines list the characteristics of each file or directory. The fields in each line are permission modes, link count, owner, size, modification date and filename. If the first character of permission modes is a *d*, then the entry is a directory.

The next field, link count, tells how many directory entries there are pointing to this one physical file. Generally, this is one for an ordinary file and equal to two plus the number of contained directories for a directory entry. For more information, refer to the *ln* command that creates links. If this doesn't make sense, don't panic. Few Unix users know what this means or actually care.

The next two fields are the name of the file owner and the size of the file in bytes. Remember that even though the file size may be only 26 bytes (as in the case of the file *stuff*),

***LS**-List Contents of Directories*
% ls *[options] [directories]*
current working directory used if no *directories* specified

Options:

-a	list all entries (including ones starting with .)
-c	use time of last modification of inode in **-t** & **-l** options
-d	list only name (not contents) of directory
-f	force each argument to be interpreted as directory
-g	like **-l** but don't print owner
-i	print i-number
-l	long list (mode, links, owner, group, size, mod time)
-o	like **-l** but don't print group
-r	reverse sort order
-s	print size in blocks
-t	sort by modification time
-u	use time of last access in **-t** & **-l** options

Conventions:
A % represents the system prompt.
Bold face represents items that must be typed as they appear.
Italics represent items that are to be substituted for.
Brackets [ ] surround items that are optional.

Table 1. This shows the syntax of the **ls** *command.*

one block of 512 bytes must be allocated. This 512-byte minimum is called file system granularity.

The next two fields are the month and day that the file was last modified. This is followed by the time in hours and minutes of last modification, if the file is fairly new, or the year for files not recently modified. How long ago is not recently? I guess six months. Does anyone know for sure? The last field is the filename.

This is basically what you can do with the *ls* command. The actual format may differ somewhat between systems, but your system reference should explain exactly what your system will do. Some of the other options may be used to alter the order of the output and select other information for the report.

One question that you might have is what happens if you enter the command

*ls -l **

Your first guess might be that all of your files and directories are listed. As you can see from Table 3, this doesn't happen. The files that are in the directories one more level down aren't listed. If you remember the use of the asterisk from last month's column, this makes sense. The command line is expanded by the shell to

ls -l articles framus junk stuff test

and then passes to the *ls* program. This causes *ls* to list the contents of the directories *articles* and *junk*, but that is where the filename expansion ends.

The other question you probably have is what is all the other stuff, the *rwxr-xr-x* stuff in the first field of the output? It is access permission information, and I've skipped it on purpose. The subject of next month's column is file security. At that time, I'll talk about access permissions, how to set them and use them to protect your files.

New Unix Products

Each month new systems are announced that run Unix. Some are from small companies, some from large. Few companies could make the kind of announcement that I'm about to describe.

The 3B20D is a lot of computer for only $340,000, but if that's more than you had in mind, AT&T has a low-end system that's more like it.

On March 27, AT&T announced three large systems, two medium-sized systems and one low-end system. All of these computers run Unix. At the high end is the 3B20D system that is designed to run almost forever. It features redundant hardware, self-checking and automatic error recovery. There are currently hundreds in service, providing an average of less than ten minutes per year of downtime for any reason.

It sounds like a lot of computer for only $340,000. Maybe it's a little more than you had in mind. AT&T's low-end system is probably more like it. It is the 3B2/300, a desktop 32-bit micro running up to 18 terminals. It uses the WE 32000 microprocessor (formerly the BellMac 32), can support up to 2MB of RAM, up to a 32MB hard disk, a floppy and 18 I/O ports.

The list price for the 3B2/300 starts at $9950. I'm sure that price is for a lot less system than the one described. It still looks competitive with current systems. I expect this will help step up the Unix system price war that has just started. AT&T won't be selling these systems to end users, so you'll have to wait to see where to buy one.

I hope to be able to evaluate various Unix implementations for the IBM PC and database management systems that run under Unix. So far, I know that both Interactive Systems and International Data Systems have announced Unix ports for the IBM PC, but I haven't seen them run. There are many database management systems, but again, I've only worked with one under Unix. As I get the chance to evaluate others, I'll let you know the results.□

Address correspondence to Phil Hughes, Specialized Systems Consultants, PO Box 7, Northgate Station, Seattle, WA 98125-0007.

```
total 23
drwxr-xr-x  4  phil     64  Mar  28  19:09  articles
-rwxr-xr-x  1  phil   9304  Mar  24  11:36  framus
drwxr-xr-x  2  phil    112  Mar  28  19:09  junk
-rw-r--r--  1  phil     26  Jun  11   1983  stuff
-rw-r--r--  1  phil    299  Mar  28  14:06  test
```

Table 2. The result of executing **ls -l**.

```
-rwxr-xr-x  1  phil   9304  Mar  24  11:36  framus
-rw-r--r--  1  phil     26  Jun  11   1983  stuff
-rw-r--r--  1  phil    299  Mar  28  14:06  test
articles:
total 2
drwxr-xr-x  2  phil     48  Mar  27  17:13  73
drwxr-xr-x  2  phil     80  Mar  28  19:10  mc_column

junk:
-rw-r--r--  1  phil     40   Jul  14   1983  hello.c
-rw-r--r--  1  phil    416  Mar  28  19:08  mine
-rwxr-xr-x  1  phil   8539  Dec  22  14:09  others
-rw-r--r--  1  phil    299  Mar  24  11:38  test
```

Table 3. The result of executing **ls -l***.

Connect Time

By Chris Crocker

Through Sleet, Rain And Dark of Night

Electronic Mail: No More Excuses Not to Write

Let's face it—I'm running out of excuses for not writing letters.

Aside from traditional postal service correspondence and voice telephone calls, computerists can now correspond in plenty of ways. Information utilities and communications companies offer electronic mailing options for on-line (terminal-to-terminal) delivery to subscribers and for physical delivery to almost anyone else. You can deliver messages and documents—without ever leaving your terminal or licking a stamp—and have a great deal of flexibility, too.

Although some other types of messaging options (like Telex, TWX and FAX) are available through major utilities and networks, I'll limit my discussion to two basic types of electronic mail services. The first is the terminal-to-terminal mail offered through information utilities for communication between subscribers. I'll focus on The Source's SourceMail, CompuServe's EMail, Delphi Mail, Western Union EasyLink and MCI Mail's Instant Letter services.

The second kind of electronic mail service is the type offering physical delivery of printed messages generated from a computer or terminal and delivered through a service such as the U.S. Postal Service's E-Com or MCI Mail's or EasyLink's physical delivery services.

Terminal-to-Terminal Mail

On-line mail is one of the most popular uses of the major information utilities. Through on-line mail, you can reach any subscriber or group of subscribers within the service you're using.

Here's a typical encounter with one of the on-line mail services. Let's say that I'm a famous author who is writing a major novel for a big West Coast publishing company. My best writing hours coincide with the few hours that my editor likes to check in with me. Rather than disturb me with daily prodding about my slipping deadlines, my editor just leaves me a message through one of the electronic mail services. When I sign on to the utility, I'm greeted with a message like this:

MAIL WAITING

Excited at the prospect of a missive from an adoring fan, I immediately direct the utility to take me to the electronic post office. After selecting a menu option such as Read Mail, I'm confronted with the following message:

TO: BBW440
FROM: ABC1234
SUBJECT: Your Manuscript
Look, Chris, the editorial board is threatening to renege on your contract and demand the return of your advance if your manuscript doesn't show up here (**miraculously**) by Thursday at noon. I fought them off as long as I could.
—John

Some on-line systems, such as CompuServe, force you to act on the message you've just read by asking you to file it (on your allotted filespace), reread it or delete it. After reading and deleting my message, I have to stall my editor until I have a chance to book and board a flight to Morocco.

Most mail systems simply have an option to write and send mail. In some mail systems, such as Delphi's, I can set up an immediate reply to the last message read simply

by typing REPLY. This sets up the heading and address, so all I have to do is type the letter, press Control-Z, and it's off! (In SourceMail, you respond to the disposition: prompt with RE to reply to a message. In MCI Mail, select ANS to answer the message.)

Here's how I'd start the letter:

```
TO: ABC1234
FROM: BBW440
SUBJECT: Death in Family
```

And then I write my message. Usually, reading on-line mail isn't too complicated. Sending it isn't all that bad, either. The real stinker is attempting to write the message using the on-line editor.

On-line Editors

Writing and editing mail has left me sputtering on more than one occasion. The text editors provided by the utility you use don't compare to the word processing package you use on your computer. If you're hoping to write a major novel on an on-line editor, I wish you luck.

All of the on-line editors discussed here are line editors. A line editor is an editor designed to manipulate—in most cases—only one line of text at a time. This means that every time you want to change part of your text, you must do it one line at a time. Deleting some of the text on one line has no effect on the remainder of the text in your document. All of this makes editing a document tedious, if not arduous, work.

Nonetheless, with a little practice, you can become proficient with the editors available. Probably the most important thing is to hit return before you reach the maximum number of characters allowed on a line. The first time I used CompuServe's Edit editor (formerly known as Filge), I was blithely typing away on a message, until I noticed that the characters were appearing more and more slowly. Finally, the system froze. I had exceeded the allowable line length without hitting return. Automatic word wrap doesn't exist on these systems. I've heard tell that with Edit, an optimum line length is around 32 characters. SourceMail's line editor truncates lines beyond 80 characters. If you want to play it safe, keep your line length within the limits.

If you're careful, you can get through the text-writing process unscathed. When I'm entering a message on an on-line editor, I check each line over before I hit return. If there's an error, I just backspace and correct it by retyping. This way, I don't have to get into an involved editing cycle just to correct a simple typographical error. That's the simplest approach. If a pesky boo-boo still sneaks through, or if you want to edit the entire text after entering it, you must enter the idiosyncratic inner world of the system editor.

Most system line editors work alike. Although the commands vary, and some features may be different, manipulating text on-line is pretty much the same across the board. It's awkward.

You should know a few basic things about your editor. First, how do you get into the editor? Secondly, how do you move from line to line? Thirdly, how do you alter your text? Finally, how do you get out of the editor?

Let's suppose that I've written my letter, and I want to read it over and change part of it. In The Source, I type .ED[return] on a new line in my document. In Delphi and MCI Mail, I select a menu option to edit, and in CompuServe, I'm already in the editor. EasyLink has no on-line editor available, so if you make a mistake, you'll have to break and restart the file.

Once you're in the editor, you have to move around in it. Some editors use line numbers to indicate the line you're on or the line you're going to. Others use relative numbers of lines. In general, line editors use commands such as top of document, bottom of document, point, print or print (number of lines), next (negative or positive number) line(s). These commands can take the form of a single letter, a single letter preceded by a slash, two letters or a full word.

I'll use The Source's system editor as an example of how line editors work. The Source system editor works by line number or by relative numbers of lines. You indicate the line you want to change by pointing to it or printing it. Let's say that I want to change a line in my message but I don't know what number line it is. First, I print out my message with line reference numbers by typing MODE NUMBER[return] to make the line numbers visible, and then P24[return] to print the first 24 lines of the message.

Here's what displays on my screen:

```
.NULL
00001: Dear John:
00002:
00003: I know I've been late, but only under
00004: very difficult circumstances.
00005: As you know, just at our previous
00006: deadline, my great aunt Lucy took
00007: ill, and I had to visit her in her
00008: rest home in Bermuda. Now, poor soul,
00009: she's given up the ghost; I'm the
00010: sole surviving heir to her estate. As
00011: you must understand, I'll be away for
00012: a while looking after the dolphin
00013: show. I promise I'll send the
00014: manuscript by May 10.
00015:                              —Chris
BOTTOM
```

This time, I'll procrastinate and plan on delivering the manuscript in November. First, I point to line 14 by typing PO14[return]. From here, I can get to line 13, for example, by pointing to it, or by entering N-1 to move to the line above. To move back to line 14 again, I type N1 (or N+1) and press return. To change a word or another string of text using The Source's system editor, I use the C command. To change May to November on the current line, I type:

```
C/May/November[return]
```

When I type P[return] to print the line again, here's how it reads:

```
I promise I'll send the manuscript by
November 4th.
```

To insert a new line, type A[return] and type your text. Don't forget the carriage return at the end of the line. If you want to delete an entire line, type D and the line number and press return.

Getting Out

Probably the most curious thing about using on-line editors is figuring out how the heck to get out once you've composed your message.

If you're using Edit to compose an EMail message, type /EX on a new line to move to a menu from which you can send the file. If you're using The Source system editor, type FILE to close your editing session and move back to SourceMail. From SourceMail, you just type .S on a new line and your message is on its way. From Delphi's editor, the command is E or EB or EBT at the asterisk prompt. If you selected the Send/Edit prompt, your message is sent. MCI Mail's Cancel command allows you to exit the editor and keep the document you've been editing; the Send command posts your message. On EasyLink, type MMMM at the end of your document to post your message.

Documentation

If you plan to use any of these system editors extensively, you should order the appropriate documentation. From The Source, order the *User's Guide to Editor and Runoff* ($19.95). From CompuServe, order the *Personal Computing Guide* ($3.95). From Delphi, you'll have to live with the on-line documentation (help from Mail or Writer's Corner)—there is no printed documentation available from Delphi about the editor at this point. MCI Mail's documentation is all on-line as well, accessible at most levels using the Help command.

Uploading from Your Computer

If your communications program allows you to upload (sometimes called autotype) files from disk, you can save yourself a lot of money, trouble and time by preparing your text in advance, using your word processor and then uploading the file into the on-line utility's filespace. You'd be surprised how much you'll save by limiting on-line text manipulation to a bare minimum.

First, create a file using your word processor (WordStar users—use nondocument mode). Be sure to keep your line length within the limits of the system you're calling. Also, make sure you have a hard carriage return at the end of every line. If you're writing several paragraphs, it's a good idea not to separate them by carriage returns—use spaces to indent the new paragraph; some services interpret two carriage returns as the end of file signal.

Some utilities have special upload commands. The Source provides several alternatives: Filetran and RCV. Each of these commands (entered at command level) allows file uploading, using flow control. Delphi's uploading command is, not surprisingly, Upload.

With short messages, I prefer to upload on the fly—I select the mailing option I want, insert the address and subject information and then upload away—no flow control, no filename, just raw, unadulterated text. In general, you'll find that this method is effective in a number of situations—it should work almost anywhere you'd normally enter text from the keyboard. Uploading like this is particularly helpful with EasyLink, because no system editor is available to manipulate your text.

Multiple Mailings and Junk

One option, available through most electronic mail systems, sends multiple mailings of the same document to a group of people. Say, for example, you want to contact people who own the same model of computer to see what software they're using. Simply search the user directory for people with this type of equipment and then send your message to this group. Several systems allow you to save the addresses in a file, and you may call them up whenever you want to contact that particular group of individuals.

Unfortunately, one of the disadvantages of being listed in a user directory is that you subject yourself to a small amount of what I call electronic junk mail. Sometimes the mail is interesting and sometimes not. Most electronic mail systems let you scan your mail and filter out the less important messages. They also allow sending of express or priority messages that go to the top of the list of messages in your mailbox.

Rates for terminal-to-terminal mail are often included in subscriptions to the carrying utility. This is true for The Source, CompuServe and Delphi. MCI Mail Instant Letters, on the other hand, cost $1 for 7500 characters, and EasyLink terminal-to-terminal messages cost 45 cents per minute at 1200 bits per second (bps) and 30 cents per minute at 300 bps.

Physically Delivered Mail

If you want to send a message or document to someone who doesn't subscribe to your utility, you can send physical messages for as little as 95 cents or as rapidly as in the next four hours, without ever leaving your computer terminal. For a one-page letter, the cheapest service is the U.S Postal Service's E-Com; it allows you to post first-class mail through your computer.

MCI Mail offers a comparable service called the MCI Letter. MCI also allows a number of quick delivery physical delivery systems, ranging from four-hour delivery to overnight delivery. Mailgrams may be sent through The Source. Western Union's EasyLink also allows physical messaging through telegrams, cablegrams, E-Com or its Computer Letter.

E-Com

E-Com stands for Electronic Computer-Originated First Class Mail. With E-Com, your computer message is transmitted to a regional Postal Service office, where it's printed out, stuffed in an envelope and sent via first class mail to the addressee. E-Com rates may vary (Delphi quotes E-Com at 95 cents for a one-page, single-address letter; The Source quotes $1.35 for the same). Granted, the price includes paper, ink, envelope, stuffing and postage, but it still doesn't seem cheaper than conventional mail (unless you live an hour from the nearest mailbox), especially if you add in connect fees.

What E-Com may lack in economy, it makes up for in convenience. It's relatively simple to use, and extremely flexible. On Delphi, for instance, you can send single-address messages (SAMs)—similar to regular letters; common text messages (COTs)—meaning that you send the same letter to a number of addresses; and text insertion messages (TIMs)—where you may vary

certain elements of the text, depending on the recipient.

Composing a letter with E-Com is simple. You first enter the name and address of the recipient and then go ahead with the text entry. Text entry is in line fashion, similar to the on-line editors I discussed before. Remember to keep your line length down below the maximum (around 65 characters is safe on most systems), or you may wind up with some pretty funky-looking documents. A short note written to a friend can end up looking like Haiku if you're not careful.

Here again, you may choose to upload from your computer. Remember, E-Com on The Source is one of the systems that uses two carriage returns in a row to close the document, so don't use double carriage returns to separate paragraphs. If you want to enter a blank line, just type [space][return] on a new line.

There are limits, of course, to the length of your messages. E-Com messages may not exceed two pages. Depending on the on-line service you're using, that may mean anywhere from 79 characters by 97 lines to 68 characters by 97 lines. E-Com on Delphi also offers a nine-line per inch format, allowing more text on a page. Because E-Com isn't on its own network, you pay the network connect and usage fees as you use it, as well as telephone charges if you don't live within a local call to the nearest node.

E-Com claims roughly a two-day delivery time for all messages sent through the system. My test message to myself through The Source, printed and posted from New York, was received three business days after transmission.

MCI Letter

The MCI letter operates similarly to E-Com except that MCI has its own network. You originate your letter on MCI and, after you send it, it's printed in a regional office and posted through first class mail. MCI features also include laser-painted reproduction of letterhead and text for MCI letters for a $20 annual fee.

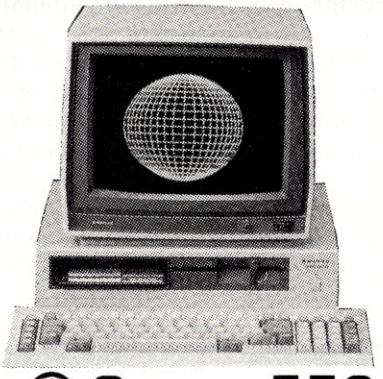
MCI Mail's rate structure is based solely on the messages you send. Using what they call the MCI ounce (7500 characters, or approximately 94 80-character lines), a one-MCI-ounce MCI letter costs $2. Because MCI charges only for transmission of messages, learning it doesn't cost you a thing, unless you send a message. In fact, MCI also offers a completely toll-free number for people who live in nonlocal node areas.

MCI boasts delivery as "usually next day." I transmitted my MCI letter to myself on a Friday evening, and it arrived on the following Wednesday. I'm beginning to see a pattern here. . . .

EasyLink Computer Letters

EasyLink Computer Letters are delivered via standard first class mail and are provided mostly for convenience, not speed. Much like the MCI letter and E-Com, computer letters are sent via first class mail. Western Union doesn't guarantee a specific delivery time.

The EasyLink system works the same for whatever type of correspondence you use, be it a terminal-to-terminal message or a telegram. You enter the code for the specific option you want to use, and then



Sanyo 550

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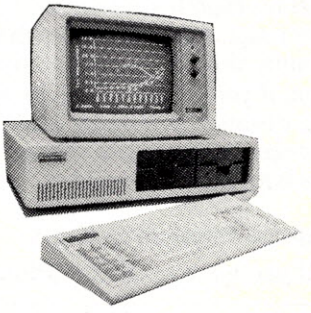

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enter the addresses for the recipients. After you've entered the addresses, you may enter the text. The Western Union people recommend uploading your messages on EasyLink, as you can edit only the current line you're working on when using EasyLink.

The EasyLink system is hard to get started on, but it becomes easy once you get used to it. Although there are a few understandable prompts, an on-line help service is available as well as telephone support. The rates for EasyLink's Computer Letters are $1.25 for the first page (2500 characters) and 40 cents for each additional page.

While there is no set-up charge and no monthly set-up fee, there is a $25 usage minimum after the third month of using EasyLink. In addition, if you're not within local calling distance to a node, you're charged 15 cents per session to use the 800 number provided.

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MCI's overnight letter and four-hour letter are printed out at the nearest MCI printing center and are hand-delivered by Purolator Courier service within the continental United States. Some places (such as Peterborough, NH) do not have four-hour service, but most receive overnight service.

Composing and sending an MCI four-hour letter or overnight letter is identical to an instant letter or MCI letter, except that you select a different sending option. An MCI Mail four-hour letter costs $25 per MCI ounce, and an overnight letter costs $6 per MCI ounce.

Telegrams sent through EasyLink are usually delivered on the same day sent. A telegram costs $1.80 per minute at 300 bps and $7.20 per minute at 1200 bps. From six a.m. to seven p.m. there is also a $3 surcharge. In off hours, the surcharge is $1.50.

Mailgrams are usually delivered via the U.S. mail on the following business day. Mailgrams sent through EasyLink cost $3 for the first page (approximately 2500 characters or 500 words) and 75 cents per page after that.

You can also send Mailgrams on The Source. It is similar to sending E-Coms on The Source, and you have the same opportunity to edit your message or use a previously stored message or address file. Mailgrams sent via The Source cost $5.15 for one single-address message of one to 100 words (add one dollar per hundred words after that). The more addresses, the lower the rates. Keep in mind that you're also paying for your time on The Source.

By the way, my test Mailgram on The Source, posted at 10:30 p.m. on a Tuesday, arrived the following Thursday. For next day delivery on The Source, the Mailgram must be sent before four p.m.

Postscript

Plenty of options are out there for electronic mail and messaging, each with its own advantages and disadvantages. Although frustrating at the outset, I think you'll find electronic mail to be one of the most useful and enjoyable means of communicating yet. In fact, why not give your folks something to smile about—drop them a line and say hi.

If you're trying it out for the first time, or if you're just on-line and you want to try out the editor or an upload, why not drop me a message to let me know how you're doing?

Next Month . . .

Next month, I'll take an in-depth look at financial services, what they offer and how even the casual market-watcher can really take advantage of the information available on-line. I'll also drop in on a few more bulletin boards, and keep you informed on what I find.□

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Techniques

By Mark Robillard

From English To ASCII

Anatomy Of a Software Compiler

Have you ever worked with a piece of computer equipment that required a strange sequence of ASCII codes, punctuation marks and the like in order to get access to the system? How about that Rhino robot that I talked about a few months ago where every order in its command language starts with an ASCII slash? Tough to remember those codes, isn't it?

Just as tough is entering them into the compiler every time you want a simple operation done. As promised a few months ago, in this month's "Techniques" I look into the design of a software compiler that takes normal English commands and turns them into those strange ASCII sequences. In fact, the compiler doesn't even require the use of English. You can substitute any language command you require.

A change for "Techniques": I'm going to talk about software this month. No soldering irons or resistors are necessary. But I'm not going to talk about it like a typical software project. You see, software can be compared to hardware in that each program is made up of small modules, much like the components on a printed circuit card. As I get into the design, you'll see how these modules interact and how it's possible to customize them.

Initial Design Preparations

Like any fine piece of electronic equipment, a program must be designed with a tremendous amount of forethought. Earlier programs written in high-level languages were developed by programmers with little educational experience. Programs began to expand from simple subroutines as needed. This type of helter-skelter programming made it difficult to improve program performance.

The forethought that went into the Translator Compiler is what must be given to any well-balanced plan. For ease of translation, the compiler is written in standard Microsoft Basic. Those of you familiar with languages like Forth or Logo will be rather at ease with the operation of the translator.

Speaking of operations, let's examine what operational modules are necessary in a program such as this. Fig. 1 outlines the basic building blocks of the Translator Compiler. As you can see, at the top of the list is a block called initialization. This is where most of the forethought takes place. Any variables that must be initialized to certain conditions or string arrays that must either be erased or set up are taken care of.

From here, you go to the block called operator I/O. The various menus that allow the operator to select from different operating parameters are generated and handled in the operator I/O stage of this program. Any time the operator or program user is involved with this program, you'll find him somewhere in the midst of this block. Keeping these rules makes it easy to debug a program and to expand upon it when necessary.

This translator takes inputs given through the keypad or keyboard of your computer, translates them into specific codes and outputs them to a target device. This output is handled through the I/O interface module. Any time you are outputting information to the target device, the code for the I/O interface is in command.

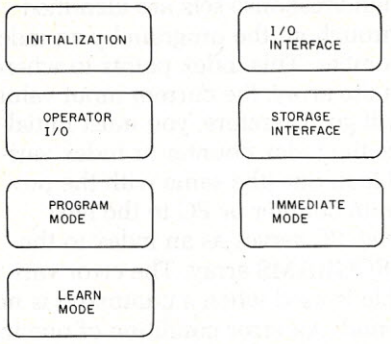

Fig. 1. List of operation modules involved in the translator program.

Likewise, the storage interface handles all transactions with an external storage medium. This allows you to store away predefined sequences of commands or, as you'll see later, to store away command words and their subsequent responses.

The last three blocks on the figure are the various modes that the translator operates in. The most important of these is the Learn mode. This program performs an intelligent self-building interaction with you. What I mean by self-building is that you're allowed to enter 500 English-like commands and then 500 responses for those commands.

Each English command word isn't stored in the program. You're asked, in the Learn mode, to enter it in from the keyboard. You're then asked to enter in a response. When you're done with a learning session, the program will (from the operator I/O subsection) ask you if you're interested in storing the commands and responses out to an external storage medium.

When you begin, before you get into the Immediate or Command modes, the program will ask if you want to access the storage medium. At this time, it asks if you care to bring in a specific command/response set that you've previously stored. Each set may carry its own unique filename title. This gives the program tremendous versatility in that you can select from different target systems just by entering the key word that brings in the command/responses for that particular system.

The Immediate mode allows you to enter commands from the keyboard that are acted on immediately. This may be compared to the Immediate or Command mode of a Basic interpreter. Simply typing the Basic statement PRINT "Hello" will provide you with an immediate Hello on the screen. In the Immediate mode of the translator, entering in a specific command that has already been learned provides you with immediate output.

The Program mode allows you to enter in a sequence of previously learned commands. This sequence is entered in line by line just like a Basic program is. Line numbers are automatically provided in this mode.

Program Flow

Well, so far I've looked at the blocks that go into the design of a translator such as this. Fig. 2 rearranges the blocks to show you the information flow within the block structure. Examining the figure closely, you'll see that from initialization, where the variables and arrays within the program are set up, the sequence immediately goes to the operator I/O subsection.

This module presents you with initial menus that allow you to select between the three various modes of operation and also allow you to load or store information via the storage interface. The interesting part of this module is that it's operating even after the Learn, Immediate or Program modes are in effect, because any operator input required by those modes will be handled there (such as storage I/O where you have the capability of storing that information out to a storage medium).

Moving down from the Operator I/O block, you see that selection of any one of the three modes brings you into that module. The Immediate mode and Program mode modules also have an outlet to the I/O interface.

From Figs. 1 and 2, you should have a good idea how the program is structured. I probably haven't gone into enough detail on what the program does. Let me give you a good example. The Scorpion robot from Rhino Robots is a wheeled device that requires an RS-232C serial command link to provide it with instructions on using various motors or sensors within the robot. One of the simpler instructions is the command that allows you to turn on the two LEDs mounted on the front of the Scorpion body. These LEDs are fondly referred to as eyes. The command sequence for turning both eyes on is: /2E3.

The slash (/) is an ASCII character that tells the robot operating system that a command is coming down the line. The 2 tells the system how many characters of information this command requires. The next two ASCII characters are, of course, the command. The ASCII E stands for the Eyes command and the 3 is a binary value that tells the command system that both lights should be on. Turning both lights on might be simply stated as an Eyes On command. This translator allows you to type in the words EYES ON and have the ASCII sequence /2E3 transmitted out to the robot.

This is, of course, a simple example. You can concatenate many command sequences together and call them up with one simple word, such as "start." The rule in the translator is that the response can be no longer than the input buffer of your particular computer. This gives you tremendous possibilities. Likewise, the command word itself can be as long.

Program Design

Let's move along now to the design of the program. I've broken up

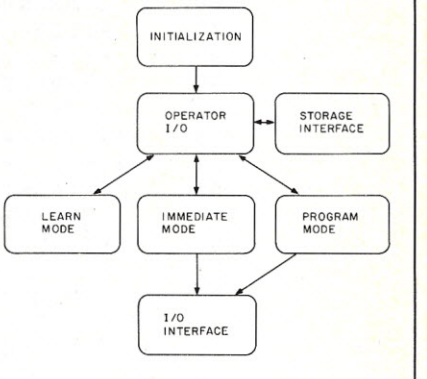

Fig. 2. Flow diagram showing the interaction between the major modules.

the listing into several smaller ones so that it can be explained and the design presented in an orderly fashion. Listing 1 is the initialization module. Here, all variables are set to their initial values. It's true that there are many variables within the program that don't need to be set to any value in particular; however, they're included in this initialization module just to show that they exist. This is a top-down, structured programming approach. Every variable must be thought of and taken care of before the program moves on. Looking at the listing, you see that initially there are three single-dimension arrays that must be set up.

A single-dimension array is a string of memory locations all under the same name heading. In this case, the first array is COMMAND$ and has 500 locations available to it. The COMMAND$ array is used to store the commands that you enter when defining a command/response set. These commands are typically English words. The RESPONSE$ array handles the actual codes that you want to send through your serial interface.

In the case of that Eyes On command, the /2E3 is part of the RESPONSE$ array. The third array is called PROGRAM$. This allows you to enter up to 500 program lines and then run them sequentially, much like you would a Basic program. As you can see, the first part of this module sets aside enough memory and defines the fact that these three arrays exist.

Moving from there, the command/response sets are identified throughout the program by an index number. This index points to where, in the array, the current input value will go. Therefore, you must initialize the index counter or index variable to one (the same with the program counter or PC in the next line). PC serves as an index to the PROGRAM$ array. The error variable is used when a command is not found. An error condition of one indicates that an abnormal situation has occurred. During normal program operation, you'll want to make sure that ERROR = 0. Therefore, in the beginning of the program, you initialize it as such.

From here, several variables are set to zero or null conditions. All of

```
1  '    COMMAND TRANSLATER
2  '     ENGLISH-TO-ASCII
4  '
5  '       c MJR DIGITAL
6  '         APRIL 1984
7  '
8  ' === PROGRAM START ===
10 '          **********************
20 '          **  INITIALIZATION  **
30 '          **      MODULE      **
40 '          **********************
50 ' SET UP COMMAND,RESPONSE,AND PROGRAM STORAGE ARRAYS
60      CLEAR 5000
70      DIM COMMAND$(500)
80      DIM RESPONSE$(500)
90      DIM PROGRAM$(500)
100 ' SET COMMAND/RESPONSE INDEX AND PROGRAM COUNTER TO FIRST ENTRY
110     INDEX=1
120     PC=1
130     ERROR=0
140     ANSWER=0:ANSWER$=""
150     COUNT=0
160     COMMAND$="":RESPONSE$=""
170     FILE$="NONAME"
180     BYTE=0:BYTES=0
190     CHARACTER$=""
200     BUSY=0
210 ' ####################################
220 ' ## SET UP INPUT/OUTPUT ADDRESSES ##
230     TRANSMIT=&HFF68
240     RECEIVE=&HFF68
250     CNTROL=&HFF6B
260     STATUS=&HFF69
270     COMMAND=&HFF6A
280 'SET UP I/O PORT FOR 9600,7-BITS,EVEN PARITY
290     POKE CNTROL,&HBE
300     POKE COMMAND,&HCB
310 ' ####################################
320 '
```

Listing 1. Initialization code.

these variables don't need to be set at these values; however, they're included here for clarification. The answer variable is used whenever the operator is asked to input a numeric response to a question. ANSWER$ is used for character input. The count variable is used for various counters within the program in a for. . .next loop. Instead of picking an arbitrary name, the word "count" is used.

Once again, you see the words COMMAND$ and RESPONSE$. These weren't parts of the array that were called out in the beginning of the initialization module. These are separate string variables that are used when entering input from the keyboard for commands and responses. The FILE$ variable is used to enter in the name of the program or command/response sets to be sent to a storage device. In this program, "storage device" refers to a disk system. BYTES and BYTE are used in the I/O module. As you'll see later, it's necessary to count the amount of actual character bytes that will be sent to the serial interface before sending them. These two variables are used for that. CHARACTER$ is also used in the I/O module. The busy variable is used to carry the status information from the serial port. With these variables out of the way, the only ones left to initialize are those that specifically control the serial port.

In the listing, this section for setting up the I/O addresses is delineated by number or pound signs (#). Wherever you see the # locations within these listings, it shows you where the code may have to be changed to conform to your particular computer. All of the addresses, in hexadecimal format, are set to variables that represent the actual functions for those addresses. That takes care of the initialization part of the program.

Operator I/O Operation

Glancing back at Fig. 2, you see that the program moves to the operator I/O module. All operator prompts and input from the keyboard are handled in this module. In several places you'll see it jump off to other modules to perform tasks (this is indicated by Gosub statements), but whenever the operator is queried, the operator I/O module is in command. Listing 2 shows the code for the operator I/O module. This is by far the largest section of the program. Reading quickly through it, you find the main menu portion, the learn prompts, immediate prompt, program prompt and storage prompts. This follows the four possible selections from the main menu.

As mentioned earlier, you must teach the computer each command and its resulting response. Teaching, in this program, is handled by the learn module. The learn prompts are entered whenever the first option of the main menu is selected. Moving down into the listing, you see that the first thing that happens in the learn prompt is that the word "Learn" is printed in the upper left-hand corner of the screen. This is set up for a 32-character by 16-line display. (Your computer's PRINT@ locations and format may be different.)

The set number displayed is the actual amount of command/response pair inputs that reflects the index variable. Therefore, initially on the screen is "Learn Set 1". It then prompts you to enter the command. After you enter the command, it prompts you to enter the response. From here, it goes on to set 2 and so forth. To exit the Learn mode, simply type a Q when asked for the command and hit the return key. This returns you to the main menu selection.

The Immediate mode, or selection 2, is much like the Immediate or Command mode of a Basic interpreter. Previously learned commands are operated on immediately after being typed. The immediate prompt section of the program looks at the command as it is typed. If it's a Q, the main menu selection is immediately displayed. If not, it goes off to the immediate module, which is shown in a later listing, to be handled as you would expect the command to be. From here, it brings you back into the immediate prompt (.) for the next command.

The Program mode, or selection 3, lets you enter in program lines much like Basic. However, this system includes an automatic line number generator. When you enter this mode, line 1 is displayed and you're allowed to enter in a command. This command, of course, must be one that was learned back at the Learn mode. As you enter in commands, the line number increments by one.

This isn't an extremely elegant program editor. It doesn't allow you to list or to edit program lines. You may add these capabilities very simply to this program if you desire. After you're finished with the Program mode, all you have to do is press the Q and hit enter, and you return to the main menu.

To store away either a command/response set or a program, simply enter option 4. From here, you're given another four options. This allows you to save or load command/response sets or programs. The bottom portion of this prompt area in the listing works with the specific disk controller that I'm using; therefore, you might have to change that portion of the listing for your computer. Once again, it goes off to something called a storage module.

You're probably wondering why I'm not explaining the operation of each portion of the program in depth. What I want to accomplish by presenting Listing 2 is to give you a feel for the way it's laid out, not its operation. As you can see, everything is delineated clearly—where is begins, where it ends. Indentation of program lines is used. Some computers won't allow indentation with the standard Basic language; however, Microsoft Basic does. It does slow up the program somewhat. But, in the case of this translator, speed really isn't the most important factor. Now to go on to the operation of each mode.

Learn Mode

Fig. 3 is a flowchart that details each step in the program for the Learn mode of operation. In this flowchart, you see that initially the prompts for command and then response are displayed. When the command prompt is satisfied by an English word, it then jumps off to the learn module. The learn, immediate and program modules are shown in Listing 3.

Listing 2. Operator I/O module.

```
330 '
340 '       ********************
350 '       ***OPERATOR I/O ***
360 '       ***    MODULE     ***
370 '       ********************
380 CLS
390 PRINT"SELECT FROM ONE OF THE FOLLOWING"
400 PRINT
410 PRINT"1. ENTER LEARN MODE"
420 PRINT"2. ENTER IMMEDIATE MODE"
430 PRINT"3. ENTER PROGRAM MODE"
440 PRINT"4. ENTER STORAGE MODE"
450     INPUT ANSWER
460     ON ANSWER GOTO 520,680,830,930
470 PRINT"TRY AGAIN"
480     FOR COUNT=1 TO 200
490     NEXT COUNT
500 GOTO 380
510 '
520 '**LEARN PROMPTS**
530 '
540 CLS
550 PRINT@0,"LEARN"
560 PRINT@10,"SET# ";INDEX
570 PRINT@96,"COMMAND:";
580     INPUT COMMAND$
590     IF COMMAND$="Q" THEN GOTO 380
600 GOSUB 1130
610 PRINT@288,"RESPONSE:";
620     INPUT RESPONSE$
630     IF RESPONSE$="Q" THEN GOTO 380
640 GOSUB 1180
650 INDEX=INDEX+1
660 GOTO 520
670 '
680 '**IMMEDIATE PROMPT**
690 '
700 CLS
710     INPUT".";COMMAND$
720     IF COMMAND$="RUN" THEN PGM=1: GOTO 750
730     IF COMMAND$="Q" THEN GOTO 380
740 GOTO 780
750 COUNT=1
760     COMMAND$=PROGRAM$(COUNT)
770     IF COMMAND$="" THEN PGM=0:GOTO 380
780 GOSUB 1230
790     IF ERROR=1 THEN PRINT"COMMAND NOT FOUND"
800 ERROR=0:COUNT=COUNT+1
810     IF PGM=1 THEN GOTO 760 ELSE GOTO 710
820 '
830 '**PROGRAM PROMPT**
840 '
850 CLS
860 PRINT PC;">";
870     INPUT COMMAND$
880     IF COMMAND$="Q" THEN GOTO 380
890 GOSUB 1370
900 PC=PC+1
910 GOTO 860
920 '
930 '**STORAGE PROMPTS**
940 '
950 CLS
```

Listing continued.

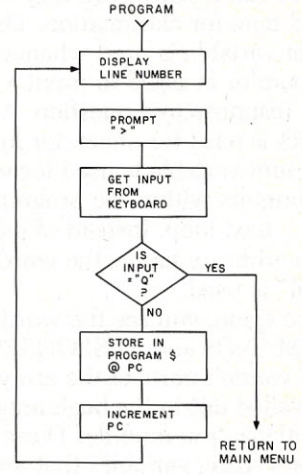

Fig. 3. Logic flowchart of the operation of the Learn mode.

Right now, jockey between Fig. 3 and Listing 3 as I explain the operation of the learn module. The COMMAND$ array holds each one of these English language commands. The index variable serves as a pointer. As each command is entered, the learn module does the job of actually placing the command into this array. From there it simply returns.

Now, some of you may be thinking, what a waste of a subroutine to just do that one program line! However, think of it this way: if you ever decide that the learn module may do other things or you would like to add to its capability, it's simple to add to that subroutine without affecting the main flow of the program. Therefore, you always know that if the program doesn't work, and the prompts seem to be okay but it's not learning correctly, then the problem is in the learn module. This compartmentalized approach to programming is what this article is all about.

As you can see, the response set is handled in the exact same way as the command set. From here, though, the index pointer is incremented by one and then you're brought back up to display the second set number and the command prompt again.

Immediate Mode

Using Fig. 4 and Listing 3, let's go

over the Immediate mode of operation. As you can see from the flowchart in Fig. 4, the period (.) prompt is entered on the screen and you're requested to type the command you wish to be operated upon immediately. The program then checks to see if this command is the quit command (the letter Q). If so, it immediately jumps back to the main menu.

If the Immediate command Run is typed, it then jumps to a special handler that performs the action of pulling out subsequent commands from the PROGRAM$ array. This lets you run the program that you entered. The immediate module handles PROGRAM$ array commands just as if an operator were typing in each one. As each command is entered, it jumps to the immediate module where the entire COMMAND$ array is compared against the input. When a match is found, its appropriate response is then pulled and sent on to the I/O module.

If it isn't found, the error indicator, as mentioned earlier in the Initialization phase, is set to one and the module jumps back to the operator I/O module where it then is tested for an error condition. If the error condition is true, the words COMMAND NOT FOUND are printed on the screen, and the next command is pulled. This same error indicator response is issued when you are typing in the commands. That about does it for the immediate section of this program.

Program Mode

From here you go down to the Program mode. As mentioned earlier, each time a program line is entered, the program counter is incremented by one. This can be seen in Fig. 5, which is the flowchart for the program module. Once again, a small program module subroutine is added, as seen in Listing 3, to simply take the command entered from the keyboard and put it into the PROGRAM$ array at the current program counter value. As always, when the Q command is typed, the main menu is displayed.

Storage Mode

The next section of the program is the storage section. The details of the module may depend upon your computer. I have provided disk I/O drivers that work in most Microsoft-type systems. Some of the syntax of the Open statement may also have to be changed. However, by looking at Fig. 6, which is the flowchart for the storage module, and Listing 4, which is the actual code, you can see that basically you have the option of four selections to either load or store both command/response sets and programs. If you select any of the save options, then an Open statement for opening up an output file on a disk is performed. Likewise, on any of the load selections, an input file is selected for disk I/O. Before this selection happens, however, the filename is requested. In

Listing continued.

```
960 PRINT"SELECT ONE OF THE FOLLOWING"
970 PRINT"1. SAVE COMMAND/RESPONSE SETS"
980 PRINT"2. LOAD COMMAND/RESPONSE SETS"
990 PRINT"3. SAVE PROGRAM"
1000 PRINT"4. LOAD PROGRAM"
1010     INPUT ANSWER
1020     INPUT"FILE NAME";FILE$
1030     IF ANSWER=1 THEN OPEN"O",1,FILE$+",CRS"
1040     IF ANSWER=2 THEN OPEN"I",1,FILE$+",CRS"
1050     IF ANSWER=3 THEN OPEN"O",1,FILE$+",PGM"
1060     IF ANSWER=4 THEN OPEN"I",1,FILE$+",PGM"
1070     ON ANSWER GOSUB 1450,1640,1780,1870
1080 INDEX=1
1090 GOTO 380
1100 '     ************************
1110 '
```

```
1120 '     ************************
1130 '     ***      LEARN       ***
1140 '     ***      MODULE      ***
1150 '     ************************
1160 COMMAND$(INDEX)=COMMAND$
1170 RETURN
1180 RESPONSE$(INDEX)=RESPONSE$
1190 RETURN
1200 '     ************************
1210 '
1220 '     ************************
1230 '     ***  IMMEDIATE      ***
1240 '     ***   MODULE        ***
1250 '     ************************
1260 FOR INDEX=1 TO 500
1270     IF COMMAND$=COMMAND$(INDEX) THEN GOTO 1310
1280 NEXT INDEX
1290 ERROR=1
1300 RETURN
1310 RESPONSE$=RESPONSE$(INDEX)
1320 GOSUB 1950
1330 RETURN
1340 '     ************************
1350 '
1360 '     ************************
1370 '     ***     PROGRAM      ***
1380 '     ***      MODULE      ***
1390 '     ************************
1400 PROGRAM$(PC)=COMMAND$
1410 RETURN
1420 '     ********************
1430 '
```

Listing 3. Listings of the learn, immediate and program modules.

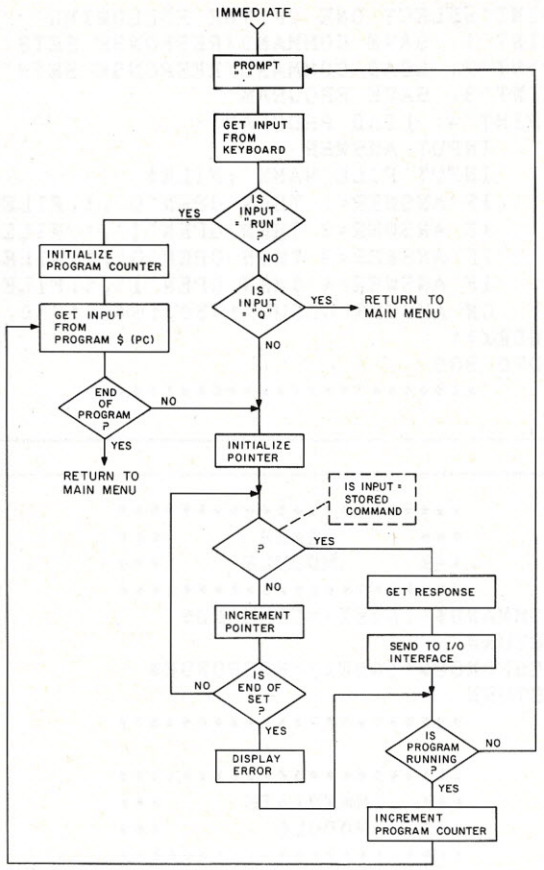

Fig. 4. Logic flowchart of the operation of the Immediate mode.

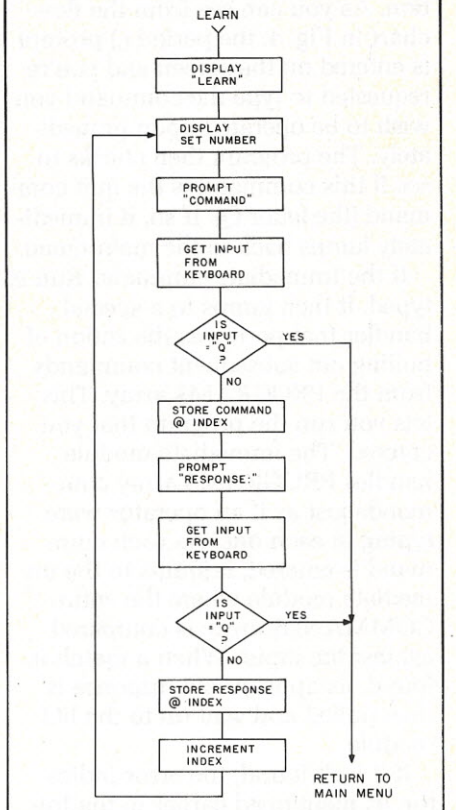

Fig. 5. Logic flowchart of the operation of the Program mode.

```
1440 '      ######################
1450 '      ##     STORAGE      ##
1460 '      ##     MODULE       ##
1470 '      ######################
1480 '
1490 ' SAVE CRS
1500 '
1510 FOR COUNT=1 TO INDEX-1
1520     WRITE#1,COMMAND$(COUNT)
1530 NEXT COUNT
1540 WRITE#1,"R"
1550 FOR COUNT=1 TO INDEX-1
1560     WRITE#1,RESPONSE$(COUNT)
1570 NEXT COUNT
1580 WRITE#1,"X"
1590 CLOSE
1600 RETURN
1610 '
1620 ' LOAD CRS
1630 '
1640 COUNT=1
1650     INPUT#1,COMMAND$
1660     IF COMMAND$="R" THEN GOTO 1700
1670     COMMAND$(COUNT)=COMMAND$
```

Listing 4. Listing of the storage module.

this particular system, a three-character extension is added to each filename to help determine, when looking at a directory, whether each file is a command/response set or a program. The CRS extension is for the command/response set and the PGM extension is used for programs.

From here, one of four different storage modules is performed depending on the selection that was made. As you can see, the listing is broken up into Save CRS, Load CRS, Save Program and Load Program. When saving command/response sets, the complete command set is pulled out one entry at a time from the COMMAND$ array. This is done with a for. . . next routine. Through the use of the For Count = 1 to Index-1 statement, the entire array is sent out to the disk one entry at a time.

The sequential disk file is constructed as a series of Write statements. When that is finished, a single character ASCII R is placed on

the disk. Then, the response set is likewise sent out to the disk. When the command and response sets have been completely sent to the disk, an ASCII character X is sent out, the file is closed and you go back to the main menu.

When saving a program, it's a little bit simpler than the command/response sets in that there is only one array to be saved; therefore, no special ASCII characters have to be sent. When loading a command/response set, you don't know how many entries there will be; therefore, a counter and some sort of a check system must be set up to determine whether you're at the end of the file on the disk. Looking at the listing, you can see that you'll be sampling each entry using the COMMAND$ variable looking for the ASCII R delimiter. If none is found, the command is stored in the array starting at location 1 and moving up until you find an ASCII R.

At that point, you begin to fill the RESPONSE$ array as you did for the COMMAND$ array. You then begin looking for an ASCII X to stop the operation and bring you back to the main menu. Loading in the program is much simpler in that it simply pulls in program lines one line at a time and looks for an end-of-file marker.

I/O Interface

The purpose of this program, as I've mentioned before, is to take simple English language commands and send them out to a translator that provides some external piece of equipment with whatever strange codes it may require. It's assumed that these codes will be sent over a serial link. It's not necessary for you to provide a serial link, for you may want to interface this program other programs that require nonEnglish-type commands.

The I/O interface module is separate from the program in that it's the last portion of the listing. Listing 5 is the complete I/O driver for the serial port used in my computer. As mentioned earlier, it's delineated by pound signs that mean you may not want to use the exact same output routine. However, you must include similar code in any serial type of program.

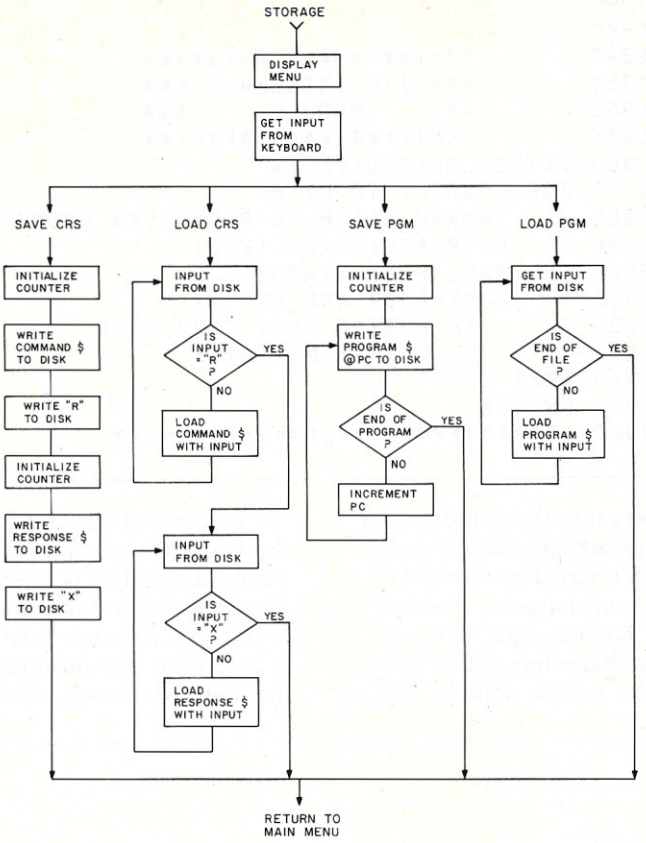

Fig. 6. Logic flowchart of the operation of the Storage mode.

Listing 5. Listing of the I/O interface module.

```
1680 COUNT=COUNT+1
1690 GOTO 1650
1700 INDEX=COUNT
1710 FOR COUNT=1 TO INDEX
1720      INPUT#1,RESPONSE$
1730      IF RESPONSE$="X" THEN GOTO 1760
1740      RESPONSE$(COUNT)=RESPONSE$
1750 NEXT COUNT
1760 CLOSE
1770 RETURN
1780 '
1790 ' SAVE PROGRAM
1800 '
1810 FOR COUNT=1 TO INDEX-1
1820      WRITE#1,PROGRAM$(COUNT)
1830 NEXT COUNT
1840 CLOSE
1850 RETURN
1860 '
1870 ' LOAD PROGRAM
1880 '
1890 COUNT=1
1900      INPUT#1,PROGRAM$(COUNT)
1910      IF NOT EOF(1) THEN COUNT=COUNT+1:GOTO 1900
1920      INDEX=COUNT
1930 CLOSE
1940 RETURN
```

Listing continued.

Listing continued.

```
1945 '
1947 '       ######################
1950 '       ### I/O INTERFACE ###
1952 '       ###     MODULE     ###
1955 '       ######################
1960 BYTES=LEN(RESPONSE$)
1970 FOR COUNT=1 TO BYTES
1980      CHARACTER$=MID$(RESPONSE$,COUNT,1)
1990      BYTE=ASC(CHARACTER$)
2000      BUSY=PEEK(STATUS)
2010      BUSY=BUSY AND 16
2020        IF BUSY=0 THEN GOTO 2000
2030        POKE TRANSMIT,BYTE
2040 NEXT COUNT
2050 RETURN
2060 '############################
```

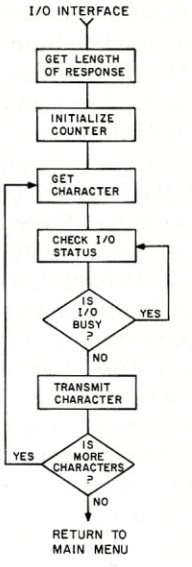

Fig. 7. Logic flowchart of the operation of the I/O interface module.

Each entry into the command or the response strings may be made up of many characters. Serial I/O ports take one character at a time. Therefore, it's necessary to know how many characters you're going to send. This can be done by finding the length of the string. Fig. 7 is a flowchart that shows you exactly what this module is doing. After the length of the response message is found, you can then take each character within that message by use of the MID$ statement, shown in line 1980 of the listing, and send it out to the I/O interface. When you have sent out an amount of characters equal to the length of the string, the program can then exit.

Conclusion

This program isn't an earth-shattering revolutionary new approach to anything. What it tries to show are the techniques used in writing a Basic program that is modular and easily understood by many people. Its usefulness can be expanded and its command and response sets are up to your imagination. You may use this program as a front-end module in a natural language interface for some larger operating system. Of course, you may not want to write it in Basic, but this introduces you to a way of handling inputs and outputs.

Next month, "Techniques" brings back the soldering iron as I examine position entry devices, joysticks, mouses and tablets. I'll explain the theories behind some of the current products on the market and show you how to interface many of these devices to micros for use as user input devices.□

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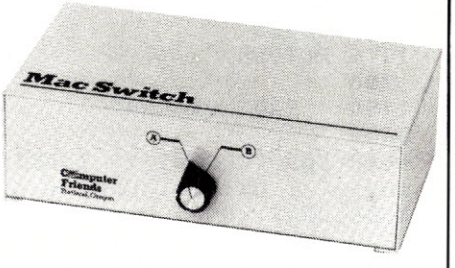

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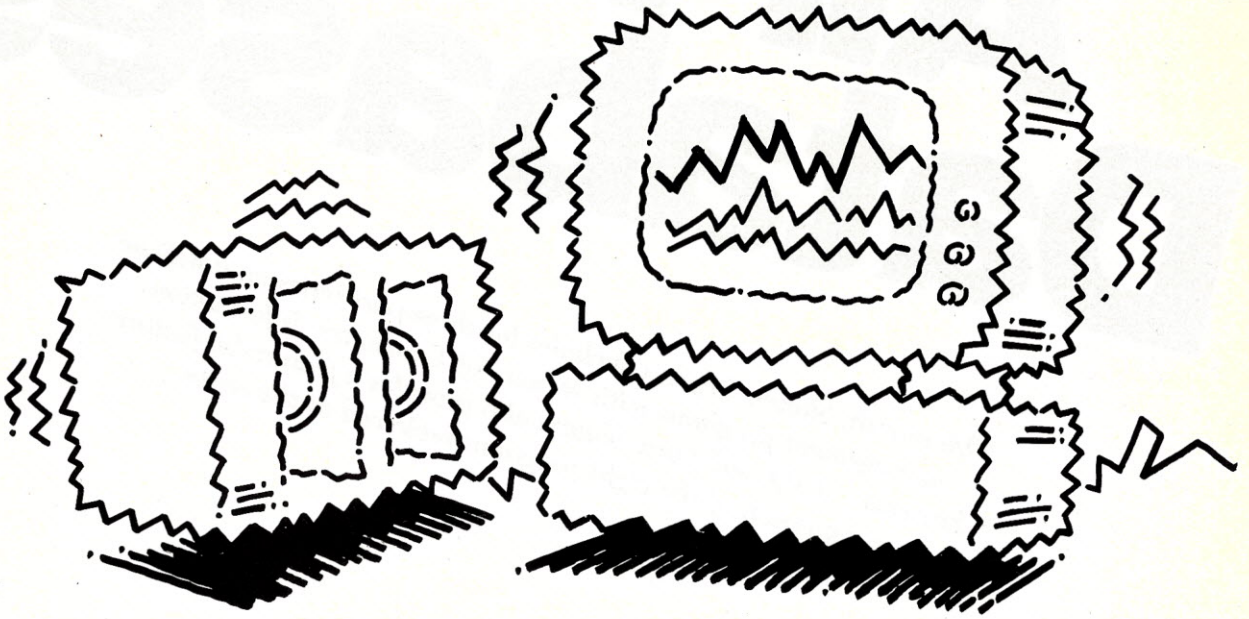

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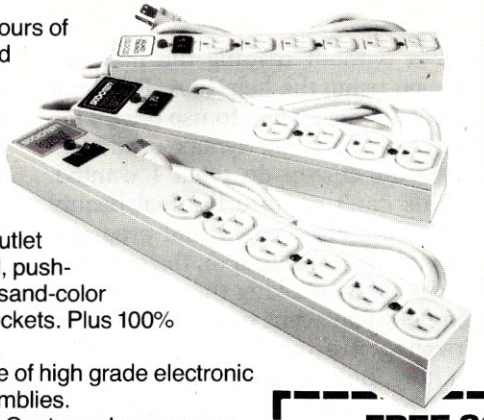

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Covering All The Databases

This month, Shawn Bryan concludes his three-part series on database management programs with reviews of Concentric Information Processor, ResQ and Aura. Shawn also provides a feature-by-feature comparison of the eight programs reviewed in the series.

By Shawn Bryan

Concentric Information Processor

Concentric Data Systems Inc.
18 Lyman St.
Westborough, MA 01581
Price: $395

CIP: A Visual Feast

If Concentric Data Systems or Concentric Information Processor sounds like too much of a mouthful for you at first, stay with me for a few minutes. The Concentric Information Processor (CIP) has some features that give you a glimpse of database management in the future, at least in terms of ease of use.

Visual Beauty

CIP is a completely screen-oriented system. I ran the test version I received without reading the manuals or even using the help files. Believe it or not, it was a snap to use once I figured out the basic syntax needed to make the screen do what I wanted. Words can't capture the real beauty of CIP because it's a visual program. Moving fields around on the screen is as simple as hooking the cursor onto the field you want to move and then dragging it around as you would a pull toy. But I'm ahead of myself...

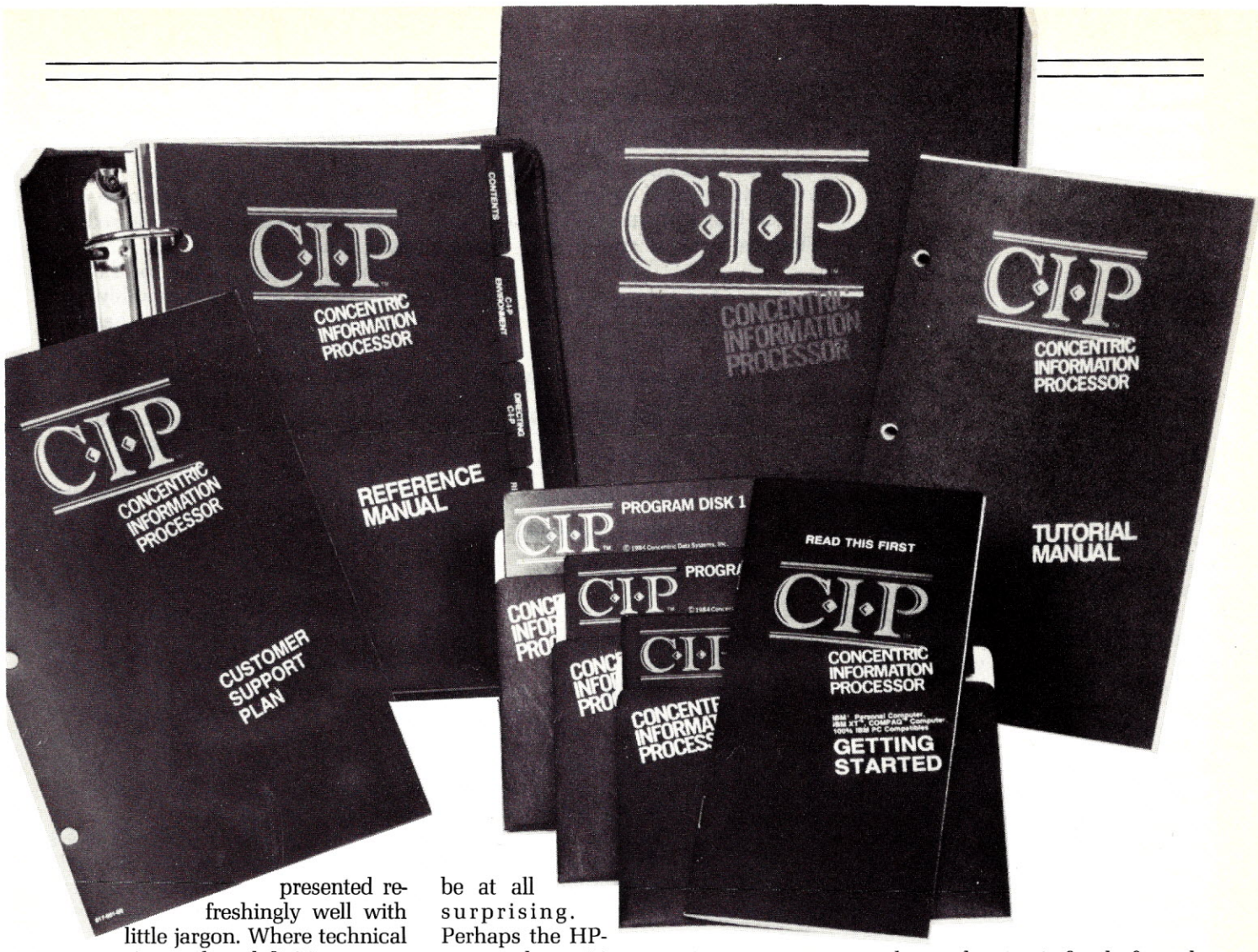
A new company produces CIP; Concentric Data Systems (CDS) received substantial venture capital to get this project off the ground. CIP is this company's first product, although all company principals have a background in the business. While it's too early to tell where the company's going, obviously some very bright people are working at CDS.

The review copy of this program was hot off the press. Advertisements for the program have already appeared in national magazines, so I'm sure the program is now available at your local computer store.

Simple Matter

The documentation for CIP is done well. It features a screen photograph on just about every page, keeping with the visual orientation of the program. Each section of the IBM-sized manual is tabbed for easy reference. The 200-page tutorial has its own index and table of contents, followed by the reference portion of the manual with an additional 235 pages of detailed information. The reference section also has its own index and table of contents. No effort is spared—your trips to the manual are as rewarding and productive as possible.

The information in the manual is



presented refreshingly well with little jargon. Where technical terms are used, a definition or explanation of the term is provided. It's a simple matter to use this manual.

What You See Is...

The entire concept behind CIP is visual presentation of data and information. The screen looks as much as possible like the final product you'll produce. The program is designed this way because the founder of CDS, John Henderson, has years of experience on larger systems that weren't visually oriented. This gave him a sense that a visual database management system would be easy to learn and use. Henderson has, in large part, completed successfully what he set out to do. I'm not aware of any other program that uses the screen as well as CIP does. You can use the cursor keys to drag fields around the screen. Everything is easily moved, and a single keystroke removes what you don't want.

As much typing as possible is eliminated by CIP's use of the cursor to point to the options available in each mode. A mouse or some other pointing method in CIP's future wouldn't be at all surprising. Perhaps the HP-150 touch-sensitive screen...

CIP supports an extensive set of arithmetic functions, including date arithmetic. Those using a database manager to keep track of accounts will welcome the ability to deduce the number of days between payments, invoices, shipments and so on.

CIP comes on three disks. The primary disk holds the program related to creating your files; the second contains report creation programs; and the third has utility programs. This is perhaps my only cause for consternation, since I don't care to be interrupted to swap disks. Of the four menu-driven programs in this series of reviews, three require more than one disk to get all the code available to the user—a function of trying to build friendly programs. The help files, prompts and menus take up space that could otherwise be used for the program itself.

The report features of CIP are extensive. The program permits five-line headers and footers, various break levels and page widths up to 132 characters. Two printers are supported, so a dot-matrix for draft work and a letter-quality printer for final copy can be hooked up at the same time with no cable swapping (if you have two printer ports).

I find the ability to "talk" to other programs is an important quality. CIP reads DIF files, delimited ASCII (such as that produced by dBase II) and labeled ASCII (like the pfs:File import syntax). I tested the program with both DIF files and ASCII (delimited and labeled) and had no trouble with data transfers.

CIP uses a fixed disk as well as floppies. With a fixed disk, there's no need to swap disks—an advantage. The floppies are copy protected, however, and one backup can be made of the system disk.

It's a Pussycat

I'm impressed with CIP. Some unique features make this program worth considering if you need a simple-to-use yet powerful system. If you are in the business of creating report screens, input screens and written reports, CIP has the best on-screen

design system I've seen. Creating fancy reports with CIP is a snap. The power of the beast is here, but the beast has turned into a pussycat, tamed to perfection.

ResQ

Key Software Inc.
2350 E. Devon Ave.
Suite 138
Des Plaines, IL 60018
Price: $395

ResQ to the Rescue

A rescue implies saving someone from slavery or danger (according to Mr. Webster). ResQ is a menu-driven database manager that claims several unique features, among them free-form screen design. The authors claim this program is directed primarily at the businessman who wants to manage data and not software.

Fear of Bulges

ResQ is packaged in the now all-but-standard 8½ × 5½-inch three-ring binder with slipcase cover. The first thing I noticed when I opened the package was the bulge at the back where the disks are stored. I discovered the bulge is due to five disks that are stuffed into the holder at the back. It turns out the creators of the program put the system on three separate disks. In addition, a practice disk is included with the software. Finally, with my evaluation copy, I received a limited 15-record version of the program (which I presume the company uses for demonstration purposes with dealers).

The program divides up this way. The screen and report form generator is on disk one. Disk two contains the examine, update and delete records program and the sort-and-print-a-report programs. Disk three contains the select records and build-an-index programs in addition to the utilities used to import an ASCII file, copy a ResQ file, reformat files, join files and combine index files. I wasn't impressed. I had visions of a lot of disk swapping.

With fear in my heart, I opened the manual, expecting to be greeted with the usual jargon about fields, records and so on. A certain amount of that exists, but for the most part this manual is free of the double talk I expect of database management documentation. There are enough basic definitions to get you off to a good start, but the rest of the manual is conversational. Numerous figures represent what you should see on the screen.

The bulk of the manual is a comprehensive tutorial section that covers just about everything the program can do. The tutorial is followed by a reference section and several appendixes. Overall, I rate the documentation better than average for the novice user. For the technical user, no detail at all about the design of the program, the language in which it is written or the way in which it stores and retrieves data is provided—clearly not a program intended for tinkering.

The power of the beast is here, but the beast has turned into a pussycat, tamed to perfection.

Things Go Smoothly

Since ResQ isn't copy protected, making working disks is a simple matter. When you load the program, you're greeted with the ResQ master menu. This menu is the same for each disk and all available options are shown. If you designate an option that's not available on the disk you loaded, ResQ prompts you to switch disks. The main menu offers options for screen and report handling, sorting, record selection and so on.

When you select from this menu, the program searches the data disk and then presents you with a screen showing the available files. The filename grid is a rectangular box containing the names of files and any associated indexes. The program asks you to point the cursor to the file you wish to use. When you complete that action, the program moves on to the selected file.

ResQ uses an initializing routine on its data disks that is placed on each disk of the program. It sets up the data disk to receive information from the program. This routine must be used on each data disk before you use it to save data, which isn't quite as clearly spelled out as it could be. Several times I tried to start a database only to be told I hadn't yet initialized the data disk.

Once you create a disk for the program to use, things go smoothly. The free-form screen design is handled quite well. Selecting that choice from the menu takes you to a blank screen where you type in information wherever you want it to appear. The program later reads what is placed on the screen to actually name data fields. The normal process is to type the prompt on the screen followed by an underscore the same length as the desired field length. Cursor position and field length are always displayed at the bottom of the screen, so you have no doubt as to the size of your file. Each file can have up to 60 information fields, and each field can be up to 80 characters long (the width of the screen). In practice, few files squeeze 60 fields to a screen or 80 characters to a field, due to size limitations on the screen.

When the screen is designed, ResQ saves the format and then prompts you for information about each field on the screen. At this time, you designate whether fields are numeric, data or alphanumeric. You also specify display options like bright, reverse, flashing or underlined to customize your entry screen. When all the prompts are answered, the program sets up the actual file and returns you to the main menu. If at a later time you wish to change the fields, you do so using the change screen format program.

The report design program uses much of the same logic as the screen design program but incorporates extensive use of the IBM function keys. A report up to 131 characters wide is possible.

Here's another fault with the program, however. There's no way to configure the program to drive printers other than the IBM/Epson MX-80 series. The program automatically defaults to the compressed print mode used by the IBM printer if your report is more than 80 characters wide. You can't use an MX-100 printer to print 132 full-sized characters across because the program assumes your printer handles only 8½-inch wide paper. More distressing, if your

printer isn't compatible with the IBM series, who knows what those control codes will produce for you? Key should seriously consider beefing up its printer support. A menu-driven printer selection program would be ideal.

My fears about disk swapping turned out to be unfounded. The program is organized so that the screen and report formats are created once and then only occasionally modified. Having a program generate those formats on a separate disk doesn't create any problems. In fact, you are spared an accidental change to a screen since you can't modify the screens without loading the proper program.

The actual printing of reports works fine. The screen used to set up the report looks like the paper it'll be printed on, right down to the formfeed holes. ResQ does a reasonably good job of explaining how to set up a report format, but the documentation here isn't as strong as in other sections of the manual. It's not clear that a report doesn't have to be columnar data. The information on setting up mailing labels, a common use of this type of program, is woefully inadequate. It appears that Key hurried this section of the manual because things are less organized. The index doesn't even list mailing labels.

Ergonomics

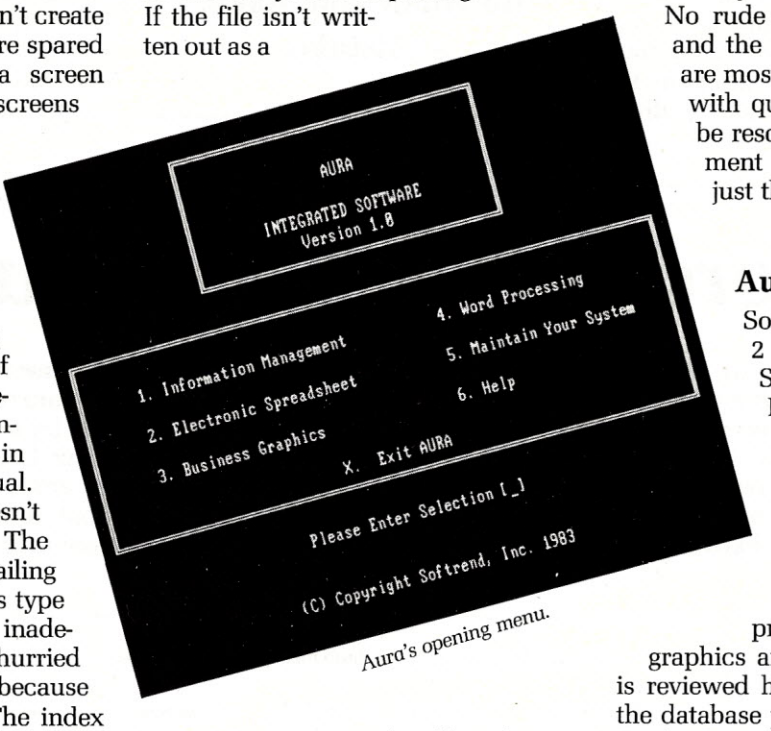
Help files are available at any time in this program. When in doubt, the F10 key calls the help facility. It's done well and the messages delivered usually give you enough information to get out of trouble. If you're hopelessly confused, pressing the end key normally gets you back to a menu. You then begin again from a familiar starting point.

Error handling is also done well, with the exception of an ungracious exit from the program back to DOS if your data disk isn't a ResQ data disk. Otherwise, error messages always appear at the bottom of the screen. They generally give you information about the error and how to correct it (like placing the proper program disk in the drive).

Key Software uses the IBM function keys to make the job of editing and entering data as easy as possible. The function key assignments are fixed in the program and can't be modified to your own situation.

Special Features

ResQ generates ASCII files for export to a word processor. The utilities menu offers the option of importing ASCII files as well. Using that function isn't quite so efficient. You must know in advance the length of the ASCII file you're importing. If the file isn't written out as a fixed-length record file, you may have some trouble getting the ASCII file matched up with the fields you defined in ResQ.



Aura's opening menu.

When you import a file, the data to be imported is shown on the screen. You mark the data to be placed in the fields in your ResQ database with the cursor. When you finish defining the ASCII field to ResQ, you press the end key and the program tries to load the ASCII fields to the ResQ field. If you define everything properly, the process works, but it took me several tries to get all the pieces to fit properly.

The method of creating indexes in ResQ is efficient. It's easy to specify what you want to use for a key field because ResQ uses familiar terms. Instead of discussing keys and indexes, ResQ uses the word sort. When you create an index, ResQ allows you to point to the field you wish to sort on with the cursor. It then creates an index on that field in either ascending or descending order. You select individual records or blocks of records that meet your specified criteria from the file. Index files can also be combined.

No Rude Surprises

ResQ has some nice features. Its use of forms painting to assist in creation of the actual fields in a record is nicely handled and a good idea. No rude surprises wait for you and the people at Key Software are most courteous when called with questions. If you need to be rescued from data management problems, ResQ may be just the ticket.

Aura
Softrend
2 Manor Parkway
Salem, NH 03079
Price: $495

An Aura of Power

Aura, marketed by Softrend, combines the database manager with a word processor, spreadsheet, graphics and sells for $495. What is reviewed here is a test version of the database program; I haven't seen the final product.

Aura is a menu-driven program. As a result, a novice can produce with the program in a hurry. Since the final version of the package isn't available for this review, I'll take you on a short tour of what this version can do.

No Doubts Left

Although I received only a copy of the preliminary documentation, I commend Softrend for what I've seen so far. I'm hopeful the final product is done as well as the three-ring binder draft version of the documentation. It is written in nontechnical terms and sample screens abound. A tutorial takes up the bulk of the manual and introduces you to the program and some of the concepts of database management.

Sample screens show you what you'll see on your monitor as you work through the program. At the back of the manual is a list of the

error messages used by Aura. The error messages are also written in as nontechnical a language as possible—with a description of the probable cause of the problem after each one. The crowning glory is that a recommended corrective action is outlined for each type of error. No more wondering what to do when you make a mistake!

The crowning glory of Aura is that a recommended corrective action is outlined for each type of error. No more wondering what to do when you make a mistake.

Many Options

Aura comes on three disks. As a result, some disk swapping is required as different modules of the program are used. The program is sensibly divided up so that the disk swapping isn't onerous. The file definition and creation programs are on one disk; the input and output programs are on another; and the utility programs are on the third disk. If you own a fixed disk, you can copy Aura to it; this speeds up operation and eliminates disk swapping.

Since Aura is written in C, it has speedy operation and transportability. Aura runs on the IBM PC and compatible machines as well as DEC terminals and Televideo terminals. Other systems are being added regularly. Printer support includes the Epson and NEC series of printers and the IDS and Okidata printers, among

A Word about the Evaluation

The evaluation of any software product carries with it a great deal of responsibility. Software is easily reviewed and rocks are easily thrown at products you don't take an immediate liking to. This isn't fair to the people who have invested countless hours and untold dollars in the creation of a product they obviously feel is worth having.

There are no standards by which software is now judged. No objective scorecard has been devised that removes the element of prejudice that inevitably sneaks into every software review.

To try to be a little more objective in this large series of reviews, I jotted down some basic information about each program and gave a score to that information. The table

Table 1. Comparison of database management programs.

Program	Relational Database	Records in Database	Fields in Record	Characters in Field	Max Record Length	Number of Open Files	Price
Aura	No	99999	256	255	65280	1	$495
Concentric Information Processor	No	65000	40	50	2000	1	$395
Condor 3	Yes	65534	127	127	16129	2	$650
Data Base Manager II	No	99999	40	60	2400	1	$295
KnowledgeMan	Yes	65532	65535	65535	65535	99999	$500
R:base	Yes	99999	400	1530	1530	40	$495
ResQ	No	32767	60	80	1760	1	$395
dBase II	Yes	65535	32	254	1000	16	$700

Program	Score	Score	Score	Score	Score	Score	Score
Aura	.00	10.00	0.04	0.04	9.96	.00	14.14
Concentric Information Processor	.00	6.50	0.01	0.01	0.31	.00	17.72
Condor 3	10.00	6.55	0.02	0.02	2.46	.00	10.77
Data Base Manager II	.00	10.00	0.01	0.01	0.37	.00	23.73
KnowledgeMan	10.00	6.55	10.00	10.00	10.00	10.00	14.00
R:base	10.00	10.00	0.06	0.23	0.23	.00	14.14
ResQ	.00	3.28	0.01	0.01	0.27	.00	17.72
dBase II	10.00	6.55	0.00488	0.04	0.15	.00	10.00

others. Configuration for your system is menu-driven, with each available option given to you for selection.

When the program begins, the master menu greets you. Four choices are available. Of interest is option 4: Help, please. The attempt to personalize the menu is obvious. How nice to think the computer responds to your good manners!

The first two options are for setting up and using your information system. The third option is the utility option, used for maintaining and identifying your system. Selecting the first option gives you a split screen. On the left side of the screen are the commands used to build, change, delete and print formats. On the right side of the screen is a list of the types of formats. Selecting an option from the left-hand menu and then from the right-hand menu takes you to the next layer of menus.

If you're building a new format, you first give the format a title. This title may be up to 24 characters long. After you give the format a title, you also give it an abbreviated title of up to eight characters. The computer uses the eight character name for file purposes but associates the longer name with the filename so you can use the more descriptive title in your dealings with the program. If you've ever tried to figure out just which file you want to use when you have several similar titles for your files, you know the value of the extra length filename. After entering the filename, you move to the field description menu.

Fielding

Fields are described to Aura through menu selections. Again, the attempt by Softrend to insulate you from the computer is largely successful. You name each field and describe the information to be contained in it. The options include character, numeric, telephone format, social security number format and others. You also tell Aura

associated with this review shows the results of such an exercise. Here's how it works:

- Relational database: yes or no. Ten for yes, zero for no.
- Records in database: max score, 10; unlimited records = 99999; formula: 99999/records*10.
- Fields in record: max score, 10; max fields = 65535; formula: 65535/fields*10.
- Characters in field: max score, 10; max characters = 65535; formula: 65535/characters*10.
- Max record length: max score, 10; max length = 65535; formula: 65535/length*10.
- Price: This one is a little tricky. The higher the price, the lower the score. Low score is ten. High score is 23. I weighted price heavier than the other sections because I think it is a primary factor in deciding what to buy. Formula: 700/price*10.
- Memory: Again, the higher the requirement, the lower the score, but this one is not weighted very heavily. Most people seem to have 128KB or more on their machines. 256KB or more is one or less. 128KB is a two. Formula: 256/memory*1.
- On-screen forms painting: either yes or no. Ten for yes, zero for no. I gave five points if this feature could be purchased as an option.
- Color: either yes or no. Ten for yes, zero for no. This one may cause you some problems, but I find color makes a world of difference in speeding up the work process.
- Copy protected: another yes or no. Ten points no, zero for yes.
- Disks: another one where less is more. The fewer disks requires for the program, the better. One is ten. Formula: 10/disks*1.

That's how the programs were scored. You have every right to disagree with the process and to come up with a better one. This one certainly isn't foolproof. S.B.

Memory (KB)	On-screen Forms Painting	Color	Copy Protected	Disks
128	Yes	No	No	3
192	Yes	Yes	Yes	3
128	Yes	No	No	2
192	Yes	No	No	1
192	Option	Yes	No	1
256	Option	No	No	1
128	Yes	No	No	3
128	No	Yes	No	1

Score	Score	Score	Score	Score	Total Score	Percent
2.00	10.00	0.00	10.00	3.33	59.51	55.67
1.33	10.00	10.00	0.00	3.33	49.21	46.04
2.00	10.00	0.00	10.00	5.00	56.82	53.16
1.33	10.00	0.00	10.00	10.00	65.44	61.22
1.33	5.00	10.00	10.00	10.00	106.89	100.00
1.00	5.00	0.00	10.00	10.00	60.67	56.76
2.00	10.00	0.00	10.00	3.33	46.62	43.61
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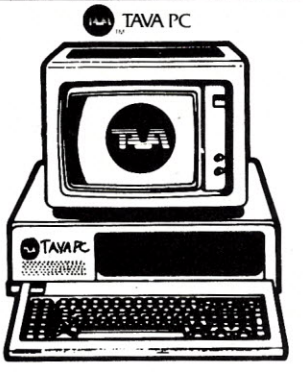

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whether or not to use each field (up to eight) as an index field. Other selections include field length and editing information about whether the field is a must fill or must enter field. Special editing is also permitted. If you want to restrict data entry to a field to numbers less than 1000, you tell the program to reject any number higher than that. Calculated fields are also permitted.

When all the fields in your file are identified, you move on to input form creation. Aura allows you to draw your form on the screen. When the data fields are typed on the screen followed by their approximate length, signified by a series of carats (^) corresponding to the number of characters in the field, you move to the next menu. This menu takes you through the process of matching up the fields you place on the screen with the fields you define in your database. Video attributes, such as reverse video, flashing and high-intensity display, are also selected for each field here. Aura menus guide each selection.

Record entry and retrieval is also menu-guided. If you have questions during any of the processes, help screens are usually available. Printed reports are created on the screen in a what-you-see-is-what-you-get format. My only problem here is that you can't define a report more than 80 characters wide. This limits some people who wish to get more information on a single piece of paper wider than the standard 80 columns that are supported.

Data input is also limited. No provisions are made for the conversion of ASCII files to Aura. As a result, you have to type in all the information used by Aura. If you have an existing file with the information already typed in, too bad. Aura doesn't provide for a conversion *to* ASCII either. This program is meant to work with only the Aura-based integrated system, which is too bad. It spoils what is otherwise a nicely done program.

Most Menu-Driven

Softrend is making a first bid in the integrated software market for microcomputers. Aura is its attempt, and if the final product succeeds in combining the database management features with the word processing and spreadsheet features, the program will have potential. Softrend has written some nice documentation for this program. I look forward to seeing the final product with the integration completed.

Aura is the most menu-driven of the programs reviewed here. As a result, it is the best suited for an individual with no need or desire to understand how computers work. Aura is a file manager and suffers the same fate of all file managers—rigid file structure. If you need a simple-to-use, easy-to-learn program, Aura is the right choice—especially if you want to combine simplicity with integration.■

Address correspondence to Shawn Bryan, Datatek, Montpelier Junction, Box 4500, Montpelier, VT 05602. Contact Shawn on The Source: BBP681; CompuServe: 71535, 1774; or MCI Mail: SBRYAN.

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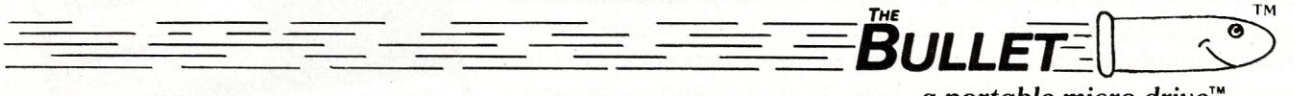

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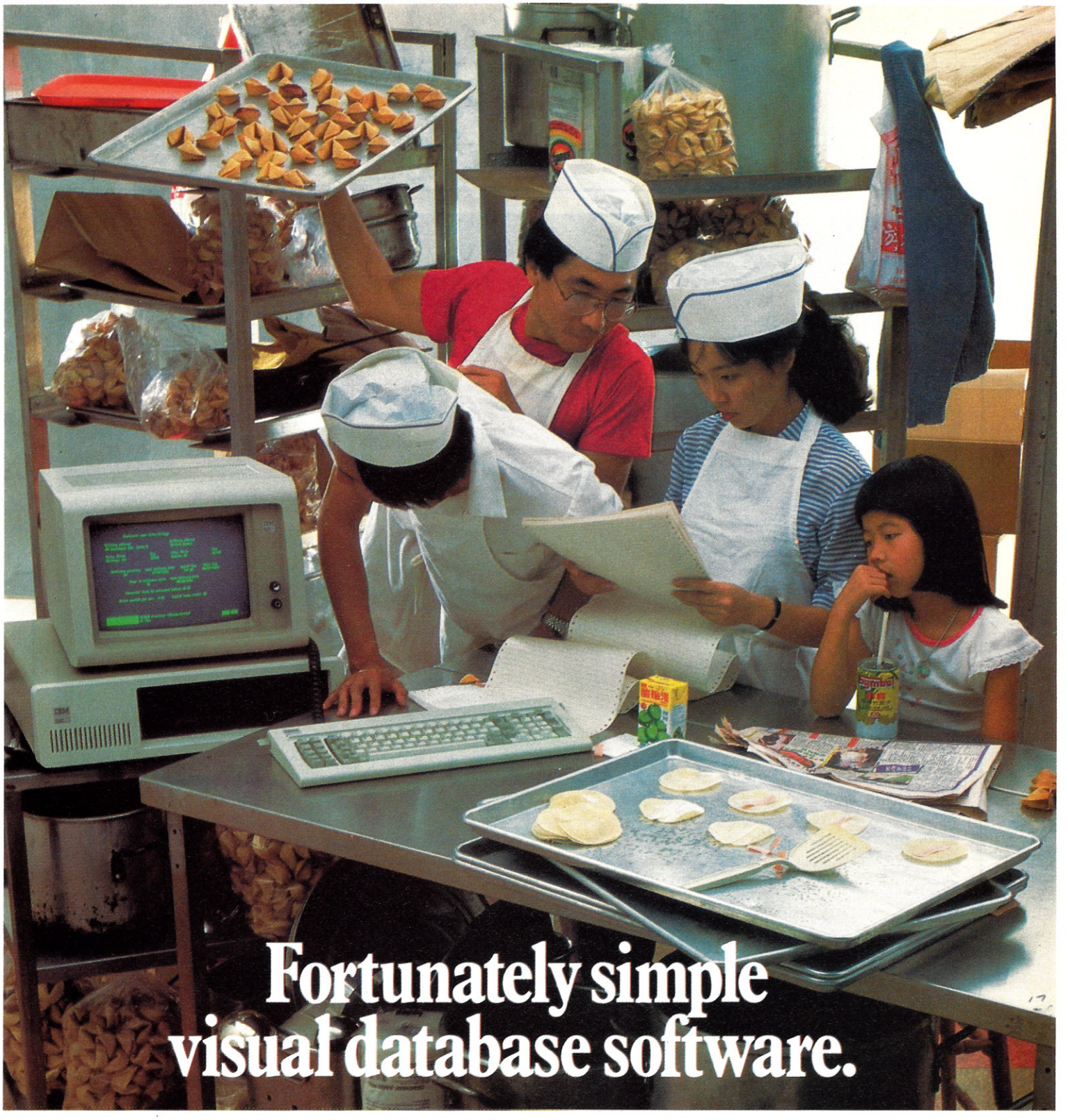

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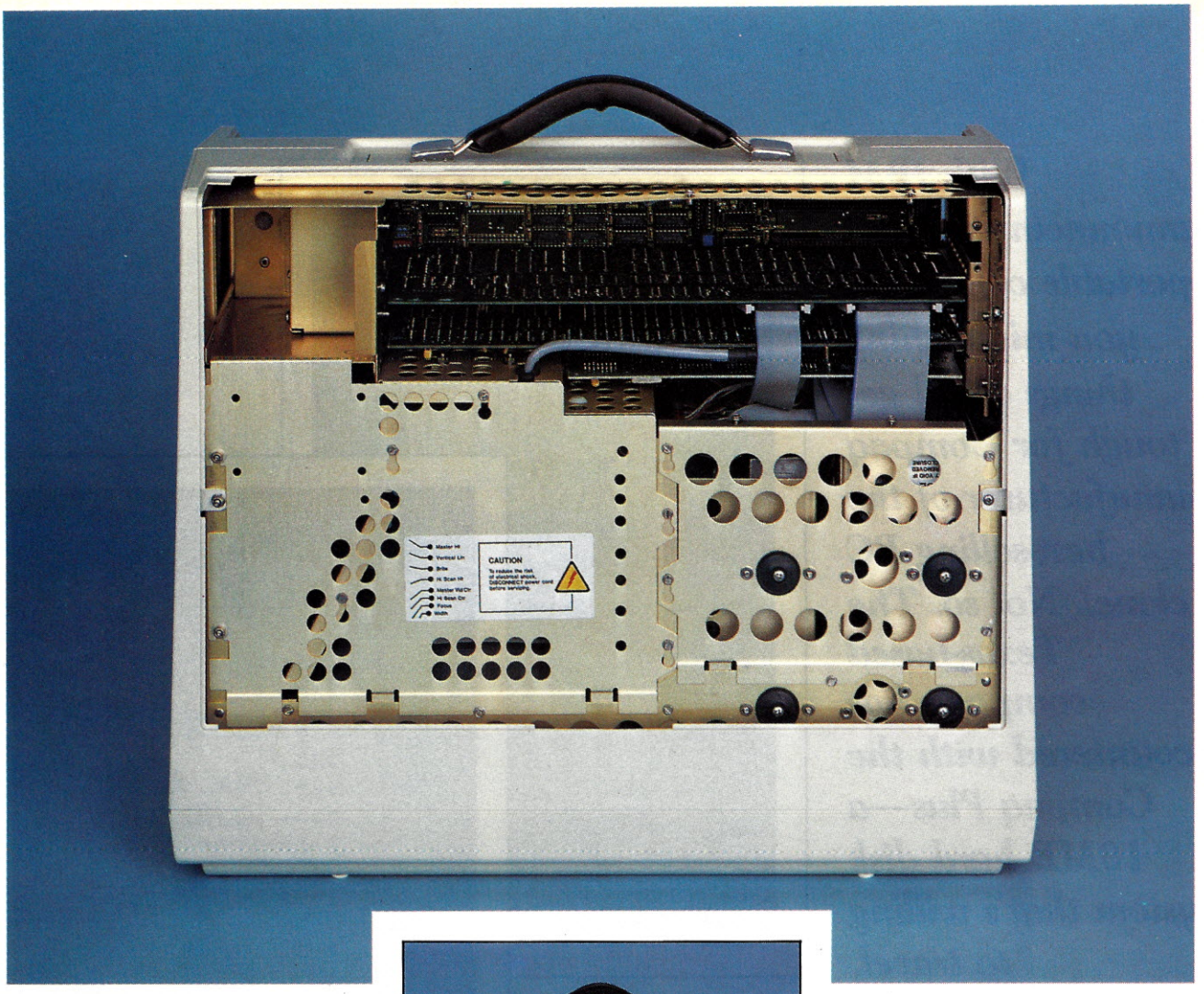
By Eric Grevstad
Senior Writer

A Hard D

With IBM announcing its own portable computer, you might think things could get tough for Compaq (manufacturer of the best-selling PC clone). Not so. The Texas-based company has countered with the Compaq Plus—a 10MB hard disk system that's willing to travel.

)isk to Go



This spring, Compaq Computer Corp. celebrated its first birthday with a TV commercial, showing three actors as the former Texas Instruments engineers who designed the Compaq on a coffee shop placemat. In the ad, the shirtsleeved execs trade gems of dialogue like, "Simply a better personal computer," "It should run thousands of programs" and "Maybe even a hard disk."

It's about as convincing as a film I saw in junior high history class, where an aide behind the president's desk intoned reverently, "This shall be known as the Monroe Doctrine." I like to think the Compaq trio actually said something like, "Let's stick a PC clone in a suitcase."

Successful Idea

The Compaq may be a simple idea, but there's no denying it's been a successful one. According to the ad, the Houston firm's $111 million in sales set a record for the first year of any American business. Its second year may be tougher; two of its competitive assets—a shortage of IBM Personal Computers and the lack of a transportable IBM—are gone, as Big Blue has tripled production and announced the Portable PC.

But IBM still doesn't offer a movable machine with a hard disk, and the Compaq Plus is still a worthy competitor. Not only is it a simple and successful idea, it's a very well-executed one.

Old Wine, New Bottle

Technologically, the Compaq's not exotic. The motherboard features the familiar Intel 8088 CPU running at the familiar 4.77 MHz, 128KB RAM (there's space for another 128KB on the main board and up to 384KB in expansion slots, for a possible total of 640KB) and a socket for an optional 8087 math coprocessor.

The factory fills three of the Compaq's five expansion slots, adding a disk controller board, parallel printer interface and video display unit (VDU) board with composite video and RGB color monitor ports, plus an rf modulator port for TV users. That leaves two slots open for after-market options such as extra memory, an RS-232C serial interface (I'd prefer to see this included) or an on-board modem.

Getting to the expansion slots is a

minor challenge and shows where the Plus differs from run-of-the-mill desktops: the thing is built like Fort Knox. The outer shell is made of tough Lexan plastic, colored off-white (with, on my review model, a spot of orange paint where I swung a car door into it). If you can pry off the Lexan lid—a difficult chore involving broken nails, credit cards and letter openers—you'll see what looks like a brass Swiss cheese but is actually the Compaq's drilled, ventilated aluminum frame. Loosening half a dozen screws and nuts lets you lift away the panel that covers the expansion area.

When you open the lid, you'll also see the rubber bushings that help cushion the Plus's 10MB hard disk. Compaq wasn't the first to put a delicate Winchester drive in a transportable micro, but that doesn't detract from its achievement. There are no special instructions or shutdown programs required before you pack up and move, and the Plus not only survived several trips between home and office but breezed through a sadistic torture test.

Actually, the computer felt better about the test than I did. Our test involved lifting the Compaq's front end, with its little feet folded away lest they break off, some three inches above the desk—and then dropping it, while the Winchester was running through a job like loading 1-2-3 or scrolling a 160-file directory. The desk shook and I winced, but the hard disk ran perfectly through five crash landings. I could have kept trying, lifting the machine six inches or a foot, but I didn't have the nerve.

As the manual says, the Compaq is unsuited for American Tourister commercials—"Although the Compaq Plus is designed to travel, avoid handling it roughly. Do not check it as baggage or throw it into the trunk of a car when traveling." But it'll take being placed in a trunk or hit with a door in stride. Moving from one desk to another in an office, it should be invulnerable.

The Outside Story

The same words that describe the Plus's mechanicals—familiar, conservative, carefully thought out—apply to its exterior. Set up, with pop-out feet supporting both the system unit and keyboard, it's a rather big, solid-looking machine.

You can put the keyboard in your lap, though leaning back from a nine-inch screen will only lessen the view. Also, you may have to play tug-of-war; the keyboard's permanently attached by a thick coiled rubber cord strong enough to pull it back to the system unit.

The board itself follows the satanic IBM layout with a tiny shift key to the left of the backslash; I suppose we're used to \p\c compatibles by now, but I wish Compaq had broken with tradition.

As for keyboard feel, my officemates describe the Compaq as mushy and plasticky; I'm less critical, but not enthusiastic about it. With the key-click turned off, it's practically silent (the Control and Alt keys work with the plus and minus keys to turn the volume up and down). That alone makes it better than IBM's, and after a few days of adjusting, I found the feel sufficiently crisp and accurate—not the best keyboard I've used, but by no means the worst.

Our sadistic torture test involved lifting the Compaq's front end some three inches above the desk—and then dropping it. The desk shook and I winced, but the hard disk ran perfectly through five crash landings.

I mentioned that the nine-inch screen discourages reading from afar, but at normal range it's clear and sharp. There's no contrast control, but the brightness knob lets you adjust the green phosphor characters adequately—and the graphics, though accompanied by a slight pop like an old TV set being turned off as the Compaq switches into graphics mode, are first-rate.

Besides 80- and 40-column text, the Plus can display high- and medium-resolution graphics (640 by 200 and 320 by 200 pixels, respectively). All are eminently readable, with enough variation to adequately simulate color for such things as pie charts (if you don't need more than three or four colors).

Maybe Even a Hard Disk

I can't praise the hard disk too extravagantly, other than to say the obvious—the speed, capacity and convenience differences between the 320KB floppy and the 10MB Winchester are like night and day. The Compaq floppy drive boots and runs PC DOS and MS DOS 1.1 and 2.0 programs like a charm, but it's the hard disk that makes the machine worthwhile for large programs and long files.

Not only do I think the Winchester makes the Compaq a terrific business database or number-crunching tool; after two months with it, I'm ready to argue that floppies are only suited for eight-bit computers and that 16-bit machines and their more sophisticated software are half useless without hard disks. Once you've had 10MB to play with, you're spoiled for anything less.

Working with the hard disk is so pleasurable you won't notice the Plus's cooling fan, which is not nearly as loud as your average wind tunnel and much quieter that those blowers used to dry airport runways. Once you walk two rooms away or turn off the machine, though, the silence will seem deafening.

Packed for Travel

Compared to eight-bit transportables, the Compaq feels a little bulky (20 by 8.5 by 16 inches) and heavy (31 pounds) for more than a short hike to the car. (Said an *MC* editor taking a test heft, "Yeah, you'd run through airports with this sucker.") Also, it took some twiddling with the plastic latches to attach the keyboard to the system unit.

Otherwise, the Plus travels in style. Cute sliding doors on the sides of the case conceal the expansion slots and the power switch, fan and cord, and there's a nicely padded, firmly attached leather handle.

The handle's real leather, which is more than I can say for the bindings of the three Compaq manuals (operations, MS DOS and Basic). They're thick paperbacks, fine in themselves but stuffed into bindings of squishy leatherette vinyl PlastiSuede, and they feel revolting.

As for content, the manuals are suitably complete and nicely indexed,

though the operations volume's oddly organized—novices must wade through 20-odd pages of keyboard layout and proper filenames before learning how to plug in and turn on the computer.

A Comfortable Compatible

The Plus comes with an MS DOS 2.02 master disk. My copy had a glitch; when I used the Format and Diskcopy commands to make a backup, I was told "Unrecoverable read error on source, track 39, side 1, target diskette may be unusable," though the new disk seemed to work well enough.

Besides the usual MS DOS utilities, the master disk includes a Compaq demo with some impressive graphics and full games. There's also Compaq's own disk-based Basic and BasicA; while the Plus will run every other piece of IBM software you can find, it can't run IBM Basic (which is partly on disk and partly in the PC's ROM). Try to run Basic with a PC DOS disk in drive A:, and the Compaq will ask for one of its own MS DOS masters. Put one in, specify the drive and you'll be in Compaq Basic.

Except for IBM Basic, though, the Compaq Plus offers exactly what made Compaq's first year so successful—virtually total PC compatibility, in a rugged transportable package—coupled with a hard disk that supplies speed and capacity enough to rival any desktop. It's not cheap, at $4995 for a 128KB system, but it's versatile and powerful. My first week with the Compaq, I joked that I'd review it in five words ("mediocre keyboard, great hard disk"); after two months of using it daily, I'll be sorry to see it leave.

Not that it'll be sorry to leave me. When a computer submits to drops onto a hard surface during disk I/O, you need a stronger word than "user friendly." ■

Manufacturer: Compaq Computer Corp., 20333 FM 149, Houston, TX 77070.
Price: $4995 (with 128KB RAM, one 320KB floppy drive, 10MB hard disk drive, parallel interface, MS DOS 2.02).

PC Compatibility: Out of the Closet

It's like dozens of companies selling acetylsalicylic acid as a pain reliever, while the formula and the word "aspirin" are patented by Bayer. A whole business, perhaps half of the microcomputer industry, revolves around IBM PC clones that run MS DOS, but the only perfect compatible is one that uses IBM's BIOS (basic input/output system), the ROM software that oversees hardware operations.

IBM has encouraged imitators with the PC's famous "open architecture" but reserves the right to sue anyone who plagiarizes its BIOS. Eagle, Corona and Handwell had to pull their machines from dealers' shelves after losing suits brought by IBM last March; the revenue lost as sales stopped cold, plus the cost of writing a new BIOS, meant a double blow for the copycats as they hurried to return to market with revised ROM chips. Naturally, the fear of being another legal target is a headache for new or prospective compatible makers.

For them, Phoenix Software Associates Ltd. has invented an aspirin substitute: a PC-compatible ROM BIOS made from scratch, guaranteed both to work like IBM's and to be safe from copyright infringement suits. An OEM license costs $290,000, including the BIOS software, Phoenix versions of MS DOS 2.11 and GW Basic (configured to resemble BasicA) and a PC DOS-compatible utilities package.

A Compatible Virgin

The Norwood, MA, company has served as a consultant and contractor for Microsoft and OEMs since 1979 (implementing MS DOS on the DEC Rainbow, for example). The new BIOS, according to President Neil Colvin, was "the first project we've ever had to run based on legal advice, not technological advice. We were driven by legal considerations from the beginning."

Those considerations mainly involved making plagiarism impossible. All that required, Colvin says, was "a 'virgin' author"—a TI 9900 programmer based in Texas who "has never seen the [IBM] tech manual and had never seen an 8086 before in his life."

After signing affidavits pledging ignorance of IBM's code, the Texan was, figuratively speaking, locked in a closet and commissioned to write "a software product to a functional specification," a list of the BIOS interrupts, functions, RAM usage and locations and entry points taken from IBM's technical reference manual.

As he finished each part of the project, keeping copious notes of his progress along the way, the developer sent his work to Phoenix's test team, which returned written descriptions of bugs and incompatibilities but no suggestions for cures.

Eventually, the author delivered a finished BIOS which met Colvin's and the lawyers' specifications: "Looking at the code, there's no relation between what he wrote and what anybody at IBM wrote," Colvin says. "It's like TI 9900 programming; it's all stack frames and things like that, a completely different kind of architecture."

Lawyers and Customers

Not only Phoenix is confident of its position; the Hartford Group of insurance companies has endorsed the code with a $2 million policy against copyright lawsuits. Says Colvin, "We don't really expect to have any trouble from IBM, because we feel that our legal standard is basically unchallengeable.

"We've already been in contact with IBM's lawyers; we've [invited] them to walk into our lawyers' office and see all the documents. They've shown no interest so far, but if they do, their lawyer is 47 feet from our lawyer. Our lawyer says that's the width of Wall Street at that point. They can see each other from their windows."

Who'll buy Phoenix's BIOS? Colvin says, "We had a number of clients already signed up before May 9 [Phoenix's official introduction]," but won't release customers' names until the customers have announced their products.

However, he downplays the prospect of a dozen new clones at ComputerLand. "There are companies not making clones for the general market, but making computers for the vertical marketplace where being PC-compatible is just another asset to them. That's a whole set of computers that people haven't even heard about, in more specialized industries like process control, agriculture, chemical plants.

"People that have been selling computer equipment to these places are now making [their machines] PC-compatible, letting people do other kinds of things on it. [Their customers] obviously want compatibility, want to run the same software, Lotuses and things like that. So a lot of [companies] will be making clones aimed at markets where they have market penetration already."

Which is not to say we've seen the last new PC for the general market. Darrell Miller, Digital Research Inc.'s marketing manager for operating systems, says that more than 50 OEMs since November have bought DRI's Concurrent PC DOS: "We go and they make us sign nondisclosure agreements and then they say 'Ta-daaa!' Wow, it's another clone. People you wouldn't believe would make clones are making clones."

And, of course, there's the firm around which Phoenix has made such an elaborate end run. Friedrich Bayer & Co.'s patents on "aspirin," as the name was trademarked, expired around 1917, but IBM shows no signs of releasing its grip on the compatibility standard.

E.G.

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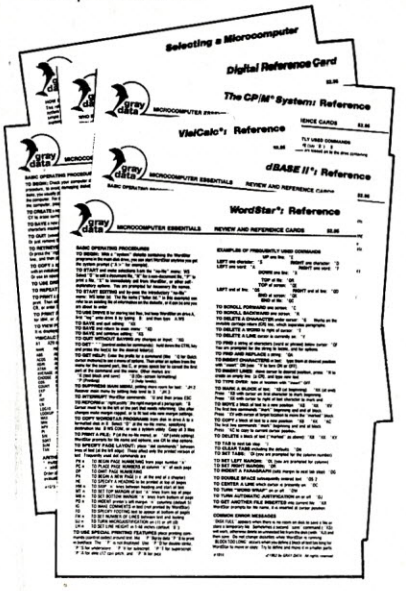

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LANG

This month we take a look at some new and some evolving microcomputer languages.

Ed Joyce starts things off with his review of Volition Systems' Modula-2 compiler. Niklaus Wirth's Modula-2 is often billed as the successor to Pascal. In his review, Joyce finds that Modula-2 offers some distinct advantages over its predecessor but notes some important steps that must be taken before Modula-2 can find success in the commercial software development field as well as in computer science classrooms.

Next, Dr. Terry Ward of the University of Northern Iowa's Academic Computing Services department offers a primer and some opinions on C, the language developed at Bell Labs and the one used to write the Unix operating system. In his article, Ward shows what it's like to program in C and explains the language's good and bad points.

Technical Editor Dave Rowell has been programming in Basic longer than he'd like to admit. His curiosity was aroused, therefore, when a review copy of MetaBasic fell at his feet. This Basic preprocessor for the IBM PC adds some structure to Basic, but some of its features are questionable.

Yours truly spent many hours with mouse in hand experimenting with some of the most exciting micro-

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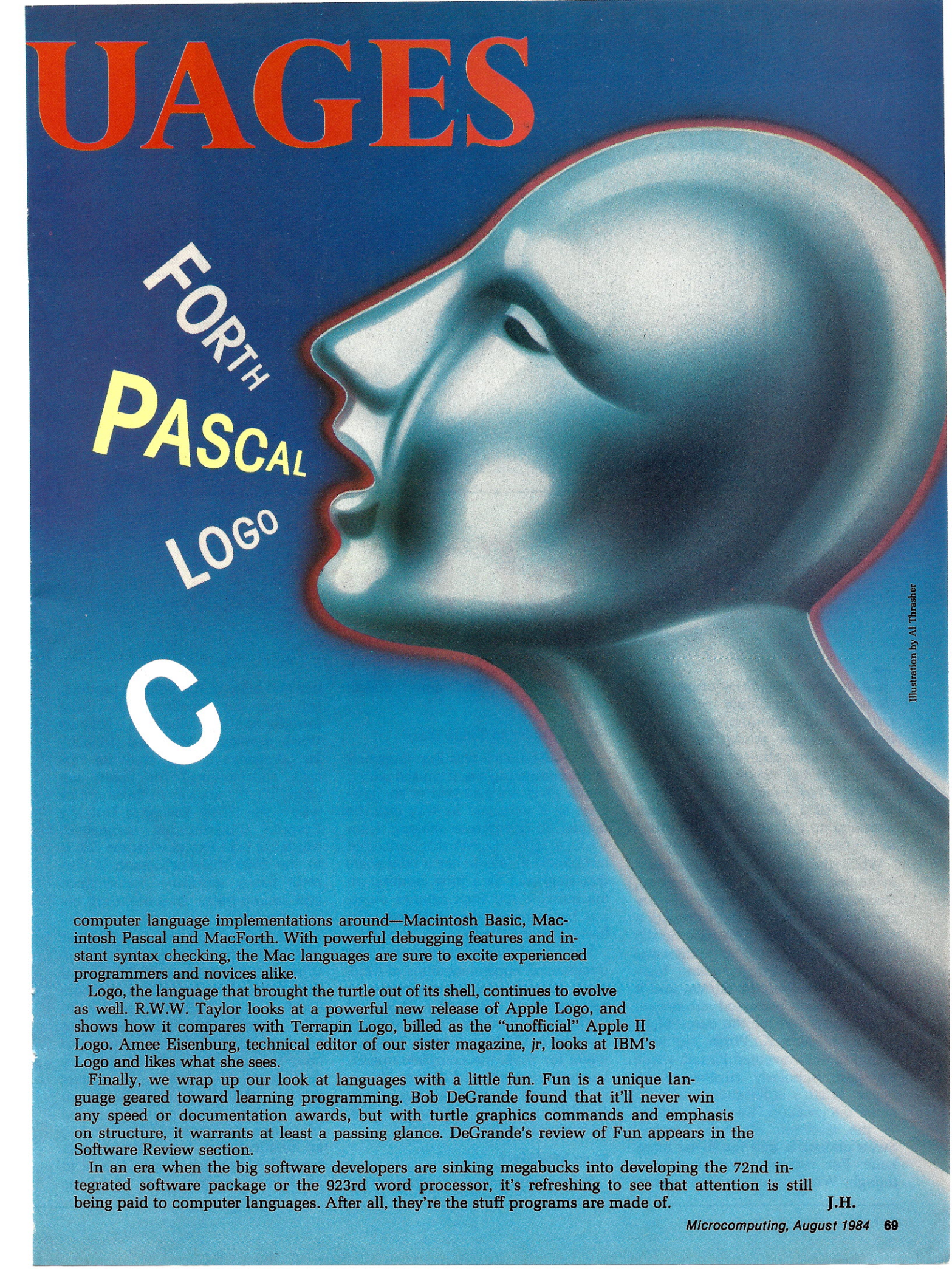


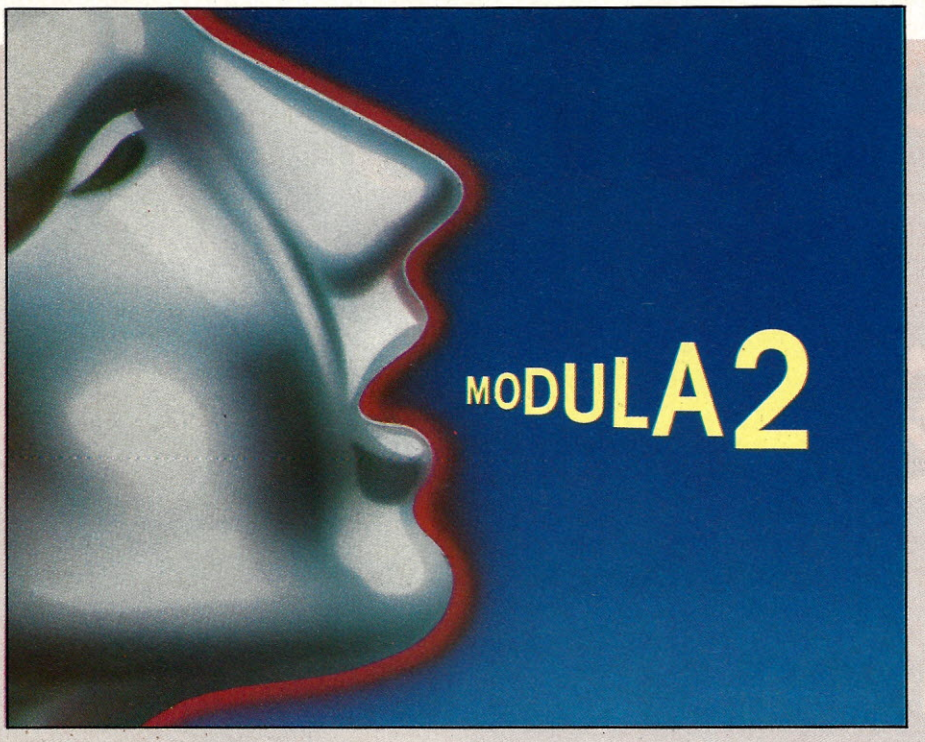
Illustration by Al Thrasher

computer language implementations around—Macintosh Basic, Macintosh Pascal and MacForth. With powerful debugging features and instant syntax checking, the Mac languages are sure to excite experienced programmers and novices alike.

Logo, the language that brought the turtle out of its shell, continues to evolve as well. R.W.W. Taylor looks at a powerful new release of Apple Logo, and shows how it compares with Terrapin Logo, billed as the "unofficial" Apple II Logo. Amee Eisenburg, technical editor of our sister magazine, *jr*, looks at IBM's Logo and likes what she sees.

Finally, we wrap up our look at languages with a little fun. Fun is a unique language geared toward learning programming. Bob DeGrande found that it'll never win any speed or documentation awards, but with turtle graphics commands and emphasis on structure, it warrants at least a passing glance. DeGrande's review of Fun appears in the Software Review section.

In an era when the big software developers are sinking megabucks into developing the 72nd integrated software package or the 923rd word processor, it's refreshing to see that attention is still being paid to computer languages. After all, they're the stuff programs are made of. **J.H.**



By
Edward Joyce

Son of Pascal

In the year 1980, three events competed for top billing in the computing press. Commodore set the home computer market on its ear with the introduction of the VIC-20 at $299. National Semiconductor unleashed a new breed of microprocessor, the 16032. And Mount St. Helens gummed up thousands of disk drives in the northwestern United States.

While the sages of computerdom magnified, analyzed, characterized, anatomized and monologized the impact of these events, the publication of a new language in Europe hardly raised an eyebrow. The publication came from the Swiss Federal Institute of Technology in Zurich, and it may well have remained submerged in academia but for the name of its author. Niklaus K. Wirth, the software ace who invented Pascal, wrote the curt, scholarly treatise of 25 pages. Wirth's colleagues sought to name the creation "Swiss Language" in the tradition of Swiss cheese, Swiss chocolate and the Swiss army knife. For reasons never explained, though, Wirth overrode their wishes and dubbed the new dialect "Modula-2."

From Ripples to Tidal Wave

When Modula-2 was first launched in the computing sea, it caused nary a ripple. Over the past year or so, however, as it managed its way into the minds of computers ranging from VAXs to IBM PCs, Wirth's brainchild has picked up steam like a tidal wave that starts out as a mist looming on the horizon and then catches everyone by surprise when it plows gale-force onto the beach.

Volition Systems claims the first commercial implementations of Modula-2. Its stable includes systems for the Apple II, IBM PC, Sage and CP/M-80 computers. The software runs in a UCSD p-System environment; for $595, the complete operating system, Advanced System Editor and 600-plus pages of documentation are delivered to your door by a uniformed messenger.

Meet Modula-2

Before immersing ourselves in the bits and bytes of the Volition product, let's whet our appetites with a brief introduction to Modula-2. Niklaus Wirth developed Modula-2 (MODUlar LAnguage 2) after studying Pascal's shortcomings for about ten years. It's his answer to those critics who write "Why Pascal Is Not My Favorite Programming Language." Modula-2 is to Pascal what the Z80 is to the 8080 microprocessor; it corrects flaws, improves performance and incorporates state-of-the-art engineering.

In a sense, Modula-2 is a product of Monday morning quarterbacking. Wirth distilled the best of Pascal and mixed this with a handful of new concepts to concoct Pascal's successor. Like Pascal, Modula-2 embodies block structure, enforces strong type checking and demands compulsory declaration of variables. Its syntax matches Pascal's closely enough so that, at first glance, programs coded in the two dialects could be mistaken as identical. For many simple routines, the conversion from Pascal to Modula-2 requires only cosmetic

modifications; the bulk of the code transfers unchanged.

The areas where Modula-2 does deviate from Pascal fall primarily into four categories. The first is the module, "the most important feature distinguishing Modula-2 from its ancestor, Pascal," according to Wirth. Modules provide program structuring capabilities unachievable with other block-structured languages. They tightly encapsulate local variables and code. Compilation of modules occurs separately and linking is performed at execution time. That is, Modula-2 pulls in a program's support modules, such as input/output or arithmetic routines, when the program is loaded.

Thus, a trivial change in a multimodule program doesn't require relinking of the entire program. To ensure that everyone plays by the rules, Modula-2 checks module interfaces when programs are loaded; it won't hand control over to a module that tries to pass an array containing the colors on Boy George's dress to a Boolean variable.

Although Modula-2 is a high-level language, it was designed for the development of all types of software, including the lowest levels of I/O drivers, operating systems and ROM code. The second primary difference between Modula-2 and Pascal involves this low-level access. The language provides facilities for manipulating machine-level data, determining the memory address of variables and accessing peripheral device registers residing at fixed memory locations.

The third main category that elevates Modula-2 above Pascal is the coroutine construct. With coroutines, programmers have a simple but powerful tool for writing interrupt drivers, process schedulers and quasiconcurrent operations.

Finally, a handful of minor problems that have annoyed Pascal programmers since day one have been corrected. A construct called the open array allows procedures to accept arrays of varying lengths. The length of an open array can be determined by calling the standard function, High. Other outstanding problems now corrected are the addition of an Else to the Case statement and relaxation of the order of declarations. The Else clause conveniently traps unspecified values in a Case. Relaxation of the order of declarations means that constants, variables, types and procedures may be specified in any order, allowing related declarations to be grouped together.

Fastest in the West

Now that I've somewhat explored, albeit briefly, the general territory of Modula-2, let's see what lies ahead on the Volition Systems' side of the fence. To size up the compiler with other language products, I ran it through the traditional Sieve of Eratosthenes benchmark program in Listing 1. Table 1 shows the results.

Volition Modula-2 clocks in at 19 seconds for compilation and 210 seconds for execution on an IBM PC with 64KB and double-sided disk drives. Compilation undoubtedly wins the prize for the fastest code generation in the west. I'm unaware of a Pascal or Modula-2 compiler for the PC that does the job in less time.

What the system gains in short compile times, unfortunately, it loses in run-time performance. The overhead of the p-System interpreter takes its toll during execution—the 210-second benchmark ranks less than average when compared with other Pascal and Modula-2 p-code-type systems.

The second benchmark in Table 1 reflects the effect of run-time range checking on performance. Modula-2 by default ensures that indexes of arrays and for and while loops remain within their bounds during execution. If an index exceeds its bounds, the program is terminated rather than left to drift into the Twilight Zone. The compiler allows these checks to be turned off, which they were in Benchmark 1 to put this product on equal footing with other languages that don't use range-time checks. Benchmark 2 in Table 1 shows the results with range checking enabled. In the Sieve program, range checking increases execution time by about 14 percent and object file size by about seven percent.

Besides performance, the robustness of the library plays a key role in gauging a Modula-2 system. Since Modula-2 is by design a simple language, much of its power stems from the library modules supplied with the implementation. Volition provides the standard library defined by Wirth, namely, procedures for terminal and file I/O, and the math functions square root, exponentiation, natural logarithm, sine, cosine and inverse tangent. It then supplements this collection with a "utility library" that saves the programmer from reinventing the wheel in many cases.

Programmers writing business-oriented applications will be especially pleased with the decimal package of the utility library. This package handles decimal arithmetic up to 19 significant digits, and the output may be pretty printed in Cobol-picture style with embedded commas, decimal point and floating dollar sign.

The library's string manipulation

The documentation chalks up high marks, but if your programming experience is limited to setting the controls on a clock radio, don't expect to breeze through the manuals.

routines take the grunt-work out of parsing command lines or shifting text data. Inserting into, deleting from and comparing string arrays require only a simple procedure call.

Last but not least, conversion routines for character-to-integer data and vice versa are in the utility library. What Pascal programmer hasn't had to write one of these in his first nontrivial program?

Further Attractions

The flexibility of the compiler further enhances the attraction of the Volition offering. More than 20 directives control code generation. You may include external files, specify conditional compilation and enter parameters dynamically from the keyboard while the compiler is executing. The documentation demonstrates how these features can be used to create different versions of the same program for various systems, such as the Apple, Sage and IBM.

A directive also controls generation of a compilation listing. In my mind, this rates as a problem, though, not a benefit. The decision to list or not to list must be made prior to compiling, while editing the program. I'd much rather be able to exercise this option on the compiler command line.

Bundled with the product is the Advanced System Editor (ASE). According to Volition, "ASE brings microcomputer users the text editing and program development resources associated with much larger computers." Although ASE is a significant advance over the standard UCSD p-System editor, it falls short of a good, general-purpose text tool. I'd be much happier massaging text with a WordStar or Vedit at my fingertips.

When installing the software, you have the option of configuring a RAM disk. A RAM disk injects a shot of adrenalin into utilities like compilers and linkers that spend most of their lifetimes waiting on disk drives. "Perhaps the most rewarding reconfiguration is to run the system off the RAM disk," proclaims the user's manual.

While the software rates a passing grade in most areas, it's not without faults. The system lacks run-time error checking for overflow of integer variables, a standard feature of Modula-2. Floating-point arithmetic requires the 8087 coprocessor on the IBM PC, a luxury to PC owners with the minimum configuration. Graphics, increasingly a necessity for heavy duty software applications, is missing.

To its credit, Volition doesn't mask these limitations—they're printed in black and white in a section of the user's manual entitled "Differences and Restrictions." Additionally, Volition hasn't retired its development staff after the first release. The software gurus are working overtime on improving and expanding the system. When new releases become available, Volition directly notifies its customers, who may purchase the updated release for a price ranging from $25 to $50.

Benchmark	Execution Time	Compilation Time	Compilation Time w/List	Object File Size-Bytes
Sieve without range checks	210	19	40	208
Sieve with range checks	240	19	40	222

Table 1. Results of executing Sieve of Eratosthenes prime number algorithm in Volition Modula-2. All times are given in seconds for an IBM PC with 64KB of memory and dual floppy disks. The compilation times were measured with and without generating a listing file.

Documentation

The area in which Volition's Modula-2 clearly stands out as a superior product is the documentation. The one-and-a-half-inch thick user's manual chalks up high marks as a lucid, well-organized, consistent presentation. Each of the six sections in the loose-leaf binder starts out with an overview of the material covered and ends with an index for quick referencing.

If your previous programming experience is limited to setting the controls on a clock radio, don't expect to breeze through the manuals—the authors didn't write a correspondence course in programming. However, couple this documentation with the book *Programming In Modula-2* by Niklaus Wirth (that's included with the system), and you have the most comprehensive treatment of Modula-2 available as of this writing. For example, you'll be hard-pressed to find a better explanation of definition modules, implementation modules, import lists, export lists and some of the other more abstract constructs of the language.

The manual eases experienced Pascal bit-bangers into Modula-2 by spelling out the differences between the languages in an 80-page introduction. With this tutorial, Pascal programmers should feel right at home in the land of Modula-2 in a matter of hours.

The Big Question

Overall, Volition has done a reasonable job of implementing Modula-2.

At this point, the big question is whether or not it's reasonable enough to warrant 595 hard-earned greenbacks. I'll answer that question with a qualified yes and no. If you're sold on the UCSD p-System for love or money, then Volition's Modula-2 is the way to go. You receive the complete p-System with a Modula-2 compiler, Pascal compiler and ASE editor, excellent documentation and telephone support through Volition's California headquarters.

Just as important, you can transfer applications written in Modula-2 across hardware boundaries that would be insurmountable in other languages. For instance, a statistical program written in Volition Modula-2 for the IBM PC will plug right into the Apple II and Sage, assuming you stick to the standard repertoire of the language. Or in a classroom situation where students are using diverse hardware, such as IBM PCs and Apple IIs, the Volition system would mute the differences and essentially put everyone on the same wavelength.

Realistically, though, you cannot ignore the fact that UCSD p-Systems account for less than the lion's share of installed operating systems. How many development shops will invest in a language implementation that won't produce code for the MS DOS and CP/M-86 environments? Software jocks are certainly interested in the increased productivity and portability of a high-level language like Modula-2. But until the language becomes available in a solid form on their home turf, it's little more than a subject for textbooks.

Volition's entrepreneurs aren't oblivious to this fact. Even as I write this sentence, programmers are busily cranking out native code versions. Naturally, such a statement invites the inevitable question, when will they be ready? According to Joe Caporaletti, vice president of marketing and sales, Volition will begin shipping CP/M-68K and MS DOS versions of the product in the first and fourth quarters of 1984. He also expects the price to come down as large-volume software distributors and hardware manufacturers market the system.

To summarize, Modula-2 is the

```
(* Eratosthenes Sieve Prime Number Program in Modula-2 *)
MODULE Prime; (* $RANGE := FALSE: disable range checking *)

FROM InOut IMPORT WriteLn,                  (* Bring in I/O from *)
                  WriteCard,                (*  library module *)
                  WriteString;

CONST
  Size = 8190;                              (* Define largest prime *)
VAR
  Flags : ARRAY[0..Size] of BOOLEAN;        (* Indicates primes *)
  I,                                        (* Array indexes *)
  K,
  Prime,                                    (* Prime no. *)
  Count,                                    (* Counts primes founds *)
  Iter : CARDINAL;                          (* Counts iterations *)

BEGIN
  WriteLn;                                  (* Display msg for *)
  WriteString('10 iterations');             (*  setting timer *)

  FOR Iter := 1 TO 10 DO                    (* Repeat main loop 10 times *)
    Count := 0;                             (* Clear prime counter *)

    FOR I := 0 TO Size DO                   (* Initialize array *)
      Flags[I] := TRUE
    END;

    FOR I := 0 TO Size DO                   (* Find the primes *)

      IF Flags[I] THEN                      (* Prime? *)
        Prime := I+I+3;                     (*  yes *)
        K := I+Prime;                       (* Index to multiple *)

        WHILE K <= Size DO                  (* Set multiples non-prime *)
          Flags[K] := FALSE;
          INC(K,Prime);                     (* Increment to next non-prime *)
        END; (* WHILE *)

        INC(Count);                         (* Increment primes found *)
      END; (* IF *)

    END; (* FOR I *)                       (* Check next array element *)

  END; (* FOR Iter *)                      (* Repeat it all 10 times *)

  WriteLn;                                  (* Display result *)
  WriteCard(Count,6);
  WriteString(' primes');
END Prime.
```

Listing 1. Sieve of Eratosthenes benchmark in Modula-2. This program performs ten iterations of calculating the 1899 prime numbers between three and 16,381. It exercises the compiler's For and While constructs and integer arithmetic.

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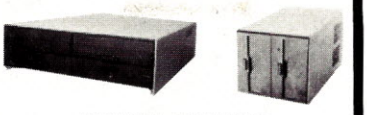

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latest addition to the Wirth family of linguistics. It has the potential to become the leading language by the end of the decade, repeating Pascal's rise in popularity during the 1970s. As for Modula-2 a la Volition, UCSD connoisseurs should be satisfied with this complete meal. For those of us who prefer only an entree to blend with our MS DOS or CP/M-86 table fare, Volition asks us to wait patiently—the stew is simmering right at this moment.■

Address correspondence to Edward Joyce, Route 9, Box 149, Charlottesville, VA 22901.

Author's Note:

Volition Systems recently cut the retail price of its Modula-2 systems by about 30 percent. The IBM PC and Sage implementations that run under the UCSD p-System were reduced from $595 to $395. The Apple II and Apple III versions were also tagged with new prices at $295 and $395, respectively.

Concurrent with the new pricing, Volition announced a Modula-2 package for PC DOS/MS DOS systems. The software executes in a p-System environment subservient to MS DOS with full access to MS DOS files and standard I/O. Included with the $395 package are Modula-2 and Pascal compilers and the Advanced System Editor.

Although this version still has significant dependencies on the p-System, it shows that Volition is moving in the direction of providing a general-purpose Modula-2 tool for the popular MS DOS world.

At the same time Volition increased its 16-bit product offerings, it discontinued the 8080 and Z80 versions of Modula-2. These products, which executed in a p-System shell within CP/M, were phased out due to "market considerations." **E.J.**

A Capsule Look At Modula-2

Manufacturer: Volition Systems, PO Box 1236, Del Mar, CA 92014.
Price: $295 and $395.
Standard Features: UCSD p-System-compatible operating system; Modula-2 compiler; Pascal compiler; ASE editor.
Documentation: 381-page Modula-2 user's manual; 141-page ASE user's manual; *Programming In Modula-2* by Niklaus Wirth (Springer-Verlag).

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By
Terry A. Ward

Power and Elegance

I have a theory that you can tell a great deal about a computer language just from studying its name and its origin.

Basic, like its name, is a simple, basic language. Pascal, named after the French philosopher, is more philosophical than practical in orientation. Lisp is really Lots of Irritating Single Parentheses.

Finally, the Department of Defense (big and ungainly with many jobs and classifications) has given us Ada, a language with no apparent end in sight. Ada, which looks like a defense contract cost overrun for software, is named for Ada Augusta Lovelace, who programmed the first analytical engine (never built because the technology was lacking in Charles Babbage's time). The Department of Defense has created Ada as the ultimate language with something for everyone. The question is, can today's technology support it?

Finally, there is C. The language is just like its name: brief (no computer language name could be shorter), powerful and elegant.

Creation of C

In 1972, C was created at Bell Laboratories by one man, Dennis Ritchie, and its structure and style reflect these solitary origins. Unlike Cobol or PL/1, which show the effect of committee input and committee politics, C has enough features to do virtually anything without needing extensions that simply confuse compilers and compiler designers. The power and sophistication of C are particularly evident in the environment of the Unix operating system. This entire operating system on Digital Equipment Corp's. PDP-11 and VAX computers was written in C.

This, then, is the key to C's popularity: power and portability can be combined in one language.

Syntax Simplified

C has a simple but powerful syntax that reflects the latest ideas concerning modularity and structured programming. C provides the capability for several kinds of loops, switch statements and even the dreaded Goto statement. This latter is a reflection of C's existence in the real world of applications and systems programming. Rather than exclude a Goto because it can be (and often is) misused, C includes the Goto for the cases when it's really the most efficient means of accomplishing a task.

C operates by means of functions that may or may not return a value to the calling program. The simple example below shows a complete C program that prints the message "This is a C Program."

```
/* This program prints a message for */
/* Microcomputing readers            */
main()
{
printf("This is a C Program./n");
}
```

That's all there is to it. The first two lines are obviously comments. In C, comments are delimited from the body of a program by /* and */ pairs. The next statement is required in all C programs. It's a function called main, simply the beginning point for your program. The next statement is a left bracket that begins a compound

statement. Anything within brackets is treated as a unit. The next statement calls a built-in C function, printf, that takes the arguments within the parentheses.

In this case, the first portion of the argument is "This is a C Program." The second portion is the odd-looking " \ n" (backslash n). The former argument supplies the text to be printed, and the latter is C's way of telling the printing device to do a linefeed to the next line. Printf takes the arguments and prints the specified text on the system printer or console.

The basic unit of operation in a C program is called a function. A function in C is analogous to a subroutine in Basic or a module in Pascal. It's a self-contained portion of program that does something. In the example above, the function is printf.

Message Time

Suppose you wanted to print a message three times. You'd write the program shown below:

```
/* Write message three times */
main( )
{
printf("This is a C Program \ n");
printf("This is a C Program \ n");
printf("This is a C Program \ n");
}
```

While this routine works, it seems foolish not to take advantage of any control structures for looping that a language might have. Control structures (a fancy computer science phrase) are those commands you use to change the sequence of a program. Some control structures include the jump or Goto types or the looping types (such as the for. . . next loop in Basic).

In Basic, for example, you can write a program for repetition with a for. . . next loop and easily produce a triplicate message. The process in C is similar. You use a control structure (the While statement) to print your message:

```
main( )
/* print message three times using a WHILE */
int i;
i=1;
{
while (i+ + < =3)
}
printf("This is a C program in a While-loop \
n");
}
}
```

I've modified the original program somewhat and included a while loop. The while loop specifies the termination condition for the loop (when i is greater than 3), the means for incrementing the counter and the testing of this counter. In this particular case, the counter is incremented after the test. Thus, the message is printed three times. The indented braces above and below the printf delimit a compound statement for the while loop. Everything between these braces is executed once during each turn of the loop.

The counter increment (i+ +) shows some of C's complexity. In its elegance and power, the syntax is sometimes a bit confusing. Unlike some languages, which have a set relationship between the time of changing the counter and testing the exit condition, C is flexible. Testing may occur either before or after the counter is changed. With the while loop, a prefixed i (+ +i) is tested before incrementing and, therefore, before the loop is performed. The postfixed form (i+ +) is tested after incrementing, i.e., after the loop is performed. These simple examples show the power and ease of writing C programs.

Another feature of C that makes it the language of choice for so many applications is the required stable of data types. The two most commonly used are character and integer. However, in full C implementations, the range extends to long types (multiple byte length integers) and to floating-point and double-precision data types. C's other data type, the escape sequence, is a standard representation of a \ (backslash) followed by a character to represent special characters like tab or new line. For example, \ n is a new line (i.e., linefeed, carriage return) and \ t is the tab character.

Variable Variety

Another of C's strengths is the number of variable types it allows. Unlike Basic, C provides for local and global variables. A variable can be used in a function without affecting anything outside that function. This is a local variable as its influence is limited only to the locality of the function. For example, C allows you to write the following program:

```
int x=123; /* this is a global variable */
main( )
{
printf("%d \ n", x); is the format for */
/* printing integers */
}
```

This program prints out the digits "123" when executed. The global variable (and its value of "123") is available for use within the main function. The following program shows how a local variable works:

```
int x=123; /* global variable again */
main( )
{
int x=789 /* this is a local variable */
printf("%d \ n",x);
}
```

The second program writes the digits "789." The local variable is used within the function locally (inside the

C is a concise language in all areas except operators. Here, the language boasts an abundance of power at the expense of clarity.

brackets) rather than globally. This ability to insulate local variables is another key to C's power. In Basic, all variables are global; therefore, any references to a variable can have catastrophic side effects if it's been used before. This is a particular problem with large Basic programs where it's difficult to keep track of variable names. In C, a locally declared variable has no such unwanted side effects.

Data Types

Generally, Basic has three data types: strings, integers and numbers. In most dialects of Basic (such as Microsoft's MBasic), they are distinguished by a suffix appended to a variable name. For example:

```
A$ = "This is a string"
B = 123.456
C% = 789
```

In C, the primary data types are integers and characters. More complete C compilers expand this list to include floating-point, double-precision and long types. While the limitation of having only integer and characters may seem inhibiting, much useful work can be done with these two. In general, however, most versions of C allow the use of floating-point numbers as well.

An integer in C is simply a whole number, like four or 675, without a fractional component. In most microcomputer C implementations, the range for integer values is from −32768 to 32767 (15 bits for the number portion and one bit for the sign). This data type fits in two bytes of memory on an eight-bit microcomputer.

Characters are precisely what their name suggests; they are characters such as "k" or the special case of new line linefeed seen above " \ n".

Powerful Operators

C is a concise language in all areas except operators. Here, the language boasts an abundance of power at the expense of clarity. In Basic, the usual operators are present: plus (+), minus (−), multiplication (*), division (/) and exponentiation (** or ^). The other operators in Basic comprise the logical operators (such as Not, EQV, or And). Finally, Basic has relational operators, such as equal (=) or not equal (< >).

C has all of these and more. The arithmetic and assignment operators are much like any other language. The statement b = 2 sets b to the value of two in either Basic or C. The C language has additional operators that enhance its power but can cause confusion. For example, the two operators below are quite different (assume a = 5):

```
I) b = + + a
II) b = a + +
```

Both operators are increment operators that increment the value of a by one. The first operation increases the value of a by one and then sets b equal to the new value. Thus, b is set equal to 6.

In the second example, b is set to the value of a, and then a is incremented by one. Thus in II above, b is set equal to 5, and then a is incremented to 6.

Obviously, the two operators are similar but they cannot be interchanged without the possiblity of disastrous consequences. They are quite powerful, however, in testing looping and conditional statements where you use the pre- or post-fixed form to check your value before or after the loop.

Control Structures

C is blessed with the benefits of current thought concerning control structures. The if, while and do loops are all present and quite powerful. As an example, the If statement is shown below:

```
if (the condition within this parentheses is true)
(this statement will be executed);
```

or, in the case of a compound set of statements within the If construction:

```
if (the condition within this parentheses is true)
{
then this line will be executed;
and so will this one;
and so will this one until;
we get to the closing bracket;
}
```

The use of the else is equally simple:

```
if (the condition here is true)
execute this statement;
else
execute this statement;
```

In addition to providing for the normal exit from an If statement, C provides for the case of an abnormal termination with the Break statement.

A second useful C control structure is the For statement. Basically, it operates as shown below:

```
for (initial condition; conditional test;
increment/decrement)
{
this line will be executed;
and so will this one;
}
```

A Sample C Program

At this point, it might be useful to look at a simple C program that uses just what you learned so far. The program (see Listing 1) will print all the prime numbers between two and 32767. The algorithm used is an example of pure brute force. It generates all the numbers between two and 32767. If a number is divisible by any number smaller than itself, it's not a prime number.

Listing 1 is fairly self-explanatory with the embedded comments. The first loop (for) generates the numbers between two and 32767. The second loop (for) generates all the numbers smaller than the first loop that are used in a simple divisibility test for primality. The If control structures test for divisibility and either do nothing (in the case of nonprime numbers) or print the number (which is prime).

While this algorithm isn't at all elegant or optimized for speed, the power of C is indicated by its performance. The program still manages to run fairly quickly on a 4 MHz Osborne I microcomputer.

Functions

Let's move to the very heart of C. In Basic, programs are either designed around straight-line code (do this, then this, then this...) or around subroutine calls. C operates with functions. In fact, I think this is one of the main keys to C's success and popularity.

A function in C is a self-contained segment of code that performs a specific task. You've already seen one function on C—printf. It's a built-in function that accepts items and formats to be printed on the output device as arguments. Any C program is essentially a series of functions united to produce a desired outcome. A program to compute factorials, for example, is shown in Listing 2.

The power of C is that you never need to write another factorial routine again. This small segment of code (a complete function) can be taken from this program and be placed in any program you desire. The basic concept of small, transportable functions is called software tools.

For example, one of the tools I've created is a driver for my Epson MX-80 printer so that I can set compressed, expanded or any number of special print modes from CP/M. If I ever change printers, the software tool will only need to be modified (for new printer codes) and recompiled. With the well-designed tools that C makes possible, the wheel need only be invented once. The standard text on C by Kernighan and Ritchie, *The C Programming Language*, provides numerous examples of useful C tools. It includes such things as word counting utilities and filters for error-free data entry.

To C or Not to C

At this point, you may be wondering whether C is for you or not. Compared with Basic, C possesses some

```
/* Print all the primes between 2 and 32767 */
main()                          /* signals start of C program          */
  {
  int i, n;                     /* declares i and n to be integers     */
  for (n = 2; n < 32767; ++n)   /* loop to generate all the            */
                                /* numbers of interest                 */
     {                          /* bracket for "for" loop              */
     for (i = 2; i<n; ++i)      /* loop to generate all smaller        */
                                /* numbers for next loop to            */
                                /* check for divisibility              */
        if (n%i == 0)           /* operator to do modulus              */
                                /* division; if remainder is 0         */
                                /* number is NOT prime                 */
           break;               /* since not prime, goto next          */
                                /* number in loop                      */
                                /* Conditional                         */
                                /* to see if                           */
        if (i == n)             /* the number only divides             */
                                /* itself evenly; it IS prime          */
        printf("%d\n",n);       /* print the prime #                   */
     }
  }
```

Listing 1. Program to print all prime numbers between two and 32767.

```
main()
/* initial C declarations and loops */
{
int i;
i = 0;
while  (++i <6)                 /* loop to produce numbers          */
                                /* to be used in the factorial      */
                                /* function                         */
    printf ("%d! is %d\n", i, factorial(i));
                                /*  our call to the factorial       */
                                /*  is embedded in our call to      */
                                /*  the function printf             */
}                               /* this bracket ends the main program */

/*  Here comes the factorial function   */
/* input is number i;                   */
/* return is i! in the variable n       */
/* This part could actually be compiled */
/* at a different time and linked with  */
/* the main program when needed         */

factorial(n)
int n;
    {
    if ( n == 1)
         return (1);            /* check for odd case of 1 */
    else
         return (n * factorial(n-1));
    }
```

Listing 2. Program to compute factorials.

Books on C

The original source for all C programmers is *The C Programming Language** (Prentice-Hall, 1978) by Brian W. Kernighan and Dennis M. Ritchie. Not designed as a text, it's the definitive source for any questions concerning the language.

Other books for learning C include:

*The C Primer**
Les Hancock and Morris Krieger.
[Assumes reader knows something of programming.]
McGraw-Hill/Byte Books, 1983
1221 Avenue of the Americas
New York, NY 10020

*Learning to Program in C**
Thomas Plum

distinct advantages. It's a structured language that is low-level enough to eliminate the need for assembler. C's execution time is approximately 50 times faster than Basic and it has compact code. However, C isn't included with any computers so there is an added cost. It's a compiled language so writing programs is a two-step process. C can also be obscure (power has its price).

In conclusion, then, both languages obviously have their place. If I were teaching young people programming, I would probably use Basic. It looks like English, and its interpretive nature provides for quick and effective feedback. If I were writing programs for a livelihood or programs that I'd need to modify later (and I have yet to write one that I haven't changed), I'd use C. The choice is essentially yours at this point. To guide your decision, I've included a few references to C books and C compilers.■

Address correspondence to Terry A. Ward, Academic Computing Services, University of Northern Iowa, Cedar Falls, IA 50614.

Both Basic and C have their place. If I were teaching young people programing, I'd use Basic. If I were writing programs for my livelihood, I'd choose C.

[Assumes no previous knowledge of programming.]
Plum Hall Books, 1983
1 Spruce Ave.
Cardiff, NJ 08232

C Programming Guide
Jack Purdum
[Explanation of C with parallel explanations of equivalent Basic programs; oriented toward the microcomputer C user.]
Que Corp., 1983
7960 Castleway Drive
Indianapolis, IN 46250

*The C Puzzle Book**
Alan R. Feuer
[Puzzles for the C programming language. Designed to test and baffle the C programmer with code that needs to be deciphered. An excellent supplement to any text on C above.]
Prentice-Hall Inc., 1982
Englewood Cliffs, NJ 07632

**See* Microcomputing, May 1984, for reviews of these books.

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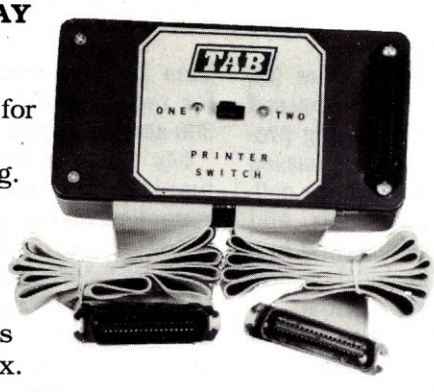

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By Dave Rowell
Technical Editor

A Sense of Structure

Here is a software product to help you write structured, well-documented programs in Basic. MetaBasic, a language preprocessor for IBM PC clones, provides extensions that make up for some of Basic's shortcomings. Statements that call subprogram modules, simplify random file I/O and add structure to the if... then...else construct make it easier to create modular, easy-to-read code.

MetaBasic provides two programs. The preprocessor takes your extended language program, consisting of Basic and MetaBasic statements, and translates it into bonafide IBM PC Basic (ASCII format). A single program is formed from a main program and any subprograms that it calls. The result can be run as is or compiled. You can add comments liberally because MetaBasic removes all remark statements from the final program.

The second supplied utility cross-references the final program with the source program(s) by line number for debugging purposes. Cross-referencing is a necessity because you must work through the additional preprocess; your new programming power has some overhead costs. The preprocessor has additional debugging options.

Language Extensions

The ability to call subprograms is provided by the Metacall, Metasubprogram and Metareturn statements. (All MetaBasic statements have the prefix Meta-, which can be abbreviated with the tilde symbol.) Subprograms are separate program files that you can use again in other applications. Subprograms can call other subprograms to many levels, but recursion isn't supported.

As you may expect, variables (including whole arrays) can be passed between programs in the calling process. The names used for the passed variables can be different in the calling and called programs. This, and the fact that other variables used in a subprogram are strictly local, makes your subprograms truly reusable.

Because variables in separate subprograms are local, MetaBasic supplies a global variable statement. A set of variables is identified by an assigned name, which must be specified in any subprogram using the common variables. As with the Metacall statement, variables can have different names in each subprogram as long as they agree in number and type.

The data initialization statement, Metadata, lets you assign values to any number of variables of any type so long as the 255-character limit isn't exceeded. Examples from the manual:

```
100 METADATA VOLTAGE /120.0/,
CURRENT /10.0/
200 METADATA X, Y, Z / 3*0 /
300 METADATA MONTH$ ( 4 TO 6 ) /"Apr",
"May", "Jun"/
```

Line 200 demonstrates a shorthand for repetitive data (three zeros); line 300 assigns values to part of an array.

My favorite feature is the structured If. The addition of an Endif statement allows you to write conditional structures involving multiple-line blocks of code without using Gotos. Nesting to "any" level is possible. Using Metaif, Metaelse, Metaelseif and Metaendif, you can write fairly complex routines that are still readable, understandable and, therefore, modifiable.

Another really nice feature is the set of random file I/O statements. With the Metarecord statement, you can define a record containing variables of any type. You can set field length if desired and string fields can be left or right justified. Once a record is defined (very simply) and values are assigned to the field variables, you use Metaopen, Metawrite and Metaread (plus the Basic Close statement) to perform all file I/O. Random file use is no longer intimidating.

Other Features

I have already mentioned that remark statements are removed by the preprocessor. Unnecessary spaces are also eliminated. You can comment and format your source code to extremes with explanations, blank lines and indentation. The running version will have none of this and will be further streamlined by renumbering.

Several features ease the debugging process. The cross-reference utility gives you source line numbers for any object lines you may be having trouble with. Both the physical line number (if you use Edlin) and the Basic line number, along with the name of the original program or subprogram, are produced.

The preprocessor utility has several useful debugging options. One produces a final running program with the source statements embedded as remarks. Another adds referenced lists of variables to the printed source code, a list for each subprogram. Lastly, you can insert trace statements in your source code (labeled as such), which are processed into the final product at your option. This can be quite handy.

Two final features I'll mention are the preprocessor option to remove all unnecessary line numbers, optimizing compilation by the IBM Basic compiler and, of course, the option to produce a printed listing of all source programs. You can store a file for printing on disk.

What Happens

MetaBasic does turn your source code into real Basic. In some cases, it improves program efficiency in ways you can't. It sometimes produces lines of code the way you would but requires less of your work to do so. But, as you will see, it can also produce blocks of code that are slow and cumbersome.

To optimize program operation, MetaBasic reduces all variable names to three characters (AAA, BAA, CAA . . .) plus one of the variable type symbols. Variable names can, therefore, be long and descriptive.

Every program has four arrays, one for each variable type. If your source code originally has three integer arrays, they all become part of the one integer array by using relative counters. This is one of the processes a human programmer would not want to keep track of. The MetaBasic manual suggests that you dimension any arrays used by the graphics Get statement as soon as possible in your programs so that Get will operate more efficiently. It makes me wonder if this process really optimizes program operation.

Subprograms are turned into Basic subroutines. Passed values are assigned to variables that are used locally in a subroutine before it's called and then passed back to the original variables after returning from the subroutine.

Metaif-else-endif structures are converted using Gotos just as a good programmer would. When your source code uses lots of Elseifs and/or nesting, you're saved from laborious planning and the high probability of making hard-to-find errors.

The one process that I really question is the assignment of data values to arrays by the Metadata statement. The resulting code is bulky and slow, even for Basic (see Fig. 1). Assigning 60 numbers to an array takes a whole page of program listing, and takes ten seconds. The equivalent routine that I'd use (Data statements and a read loop) takes seven lines and runs much faster. There must be a better way.

The Manual

The MetaBasic manual is good—nothing flashy, dot-matrix type, but written and laid out well. It presents detailed information in an orderly fashion. An introduction explains MetaBasic's features and benefits in a straightforward manner. A short tutorial then takes you through the preprocessor and cross-reference programs using sample files provided on the disk.

Next, the two utilities and the MetaBasic commands are covered in detail in organized, reference manual style. Examples of usage are given, but it's assumed, of course, that you're familiar with Basic. Programming languages, and language extensions, exhibit complex interactions between components. Most have been foreseen and presented in this section of the manual and in the appendixes.

The first of three appendixes covers the very complete message and error message sets. The second appendix is "Special considerations for selected Basic commands," a section on how to use and not use some Basic statements with MetaBasic. For example, Basic Ifs and Elses can be

Structured Basic is seductive, but getting that structure through an additional process doesn't create the ideal programming environment.

used within Metaif-else-endif structures; they're unrelated. You shouldn't use Data statements in MetaBasic programs, because it's hard to foresee which data will be read by which Read statement when subprograms are combined. A last small appendix covers use of MetaBasic with PC DOS 2.0.

To improve the manual, I'd add a small card summarizing use of the utilities and new Meta-statements. And I would clarify two points that gave me trouble. First, it's not clear how whole arrays are passed to subprograms (just use the variable name in the Call statement). Secondly, it should be pointed out clearly that all arrays must be dimensioned, even if they contain fewer than ten elements. The MetaBasic preprocessor needs this information, probably when combining all arrays of one variable type into one "superarray."

Personal Experience

To get a feel for MetaBasic, I rewrote a structured version of a game program I recently completed (part of a free-lance project). I found that I enjoyed really documenting a program for the first time with comments, borders, indentation—very pretty. The new source code, however, is four times longer than the original stripped-down version. And, of course, it took longer to write. That's the price of understandable coding.

As I've mentioned before, the Metaif-else-endif set is a joy to use, saving time and toil. Although my game doesn't use file I/O (no saved scores), the MetaBasic random file statements also fall into the category of labor savers.

The actual preprocessing involves lots of temporary files and disk I/O. MetaBasic claims the process takes two to three minutes depending on program size. My nine pages of source code were turned into a four-page Basic program in 2.5 minutes. This isn't that long, but the waiting can grow tiresome when debugging demands repetitive editing and reprocessing.

I found debugging more difficult, of course, with the additional layer to work through. Before I fully knew the ins and outs of MetaBasic, I had to cycle back numerous times because of MetaBasic errors I made, and more times because of Basic and logic errors. After each set of changes to the source code, I had to run the preprocessor again. Luckily, the cross-reference program is quick and easy to use. If you're the type who writes reusable modules, you can be glad your MetaBasic subprograms only have to be debugged once.

The final "structured" game ended up twice as long as my original program. Much of the increase was due to the page of code used to load 60 numbers into an array. The rest can be accounted for by the single-statement lines I used to make the source code more readable. Except for the slow loading of the array, the two programs functioned equally well.

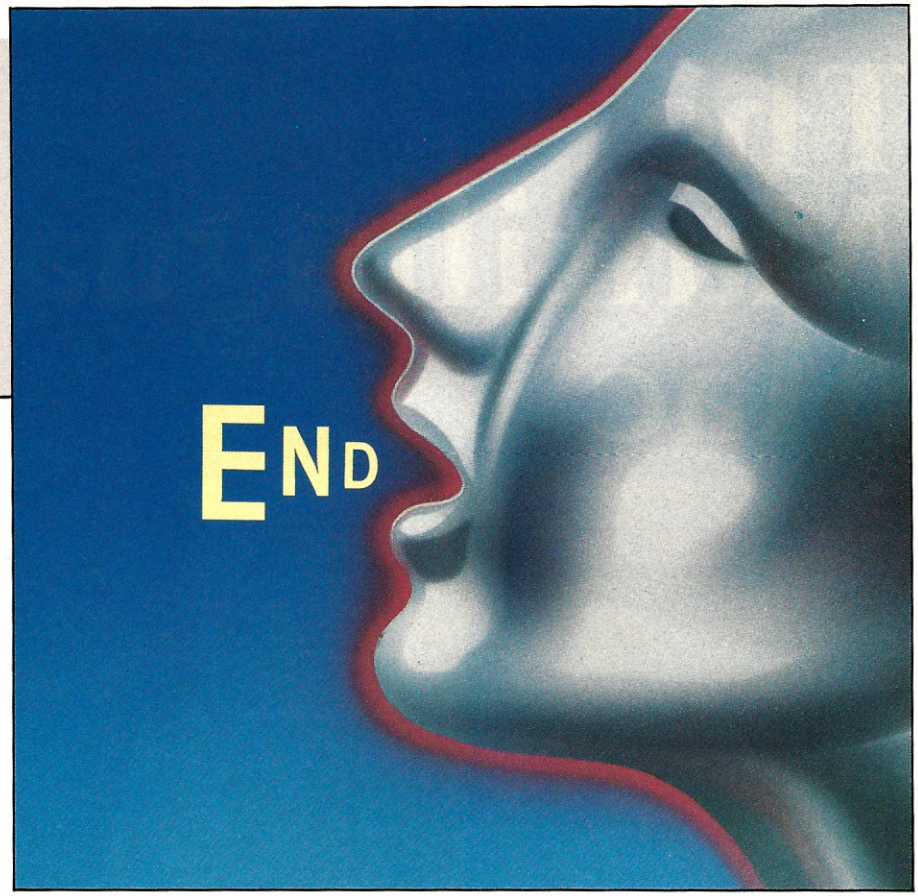
```
493 N%=0:FOR I%=1 TO 30:
494 N%=N%+1
495 IF N%>=1 AND N%<2 THEN A..%(25+I%)=523.25
496 IF N%>=2 AND N%<3 THEN A..%(25+I%)=6
497 IF N%>=3 AND N%<4 THEN A..%(25+I%)=523.25
498 IF N%>=4 AND N%<5 THEN A..%(25+I%)=3
499 IF N%>=5 AND N%<6 THEN A..%(25+I%)=523.25
500 IF N%>=6 AND N%<7 THEN A..%(25+I%)=9
501 IF N%>=7 AND N%<8 THEN A..%(25+I%)=392
502 IF N%>=8 AND N%<9 THEN A..%(25+I%)=9
                    .
                    .
                    .
```

Fig. 1. MetaBasic starts to load 30 numbers into an array.

In Summary

The promise of a structured Basic is seductive. However, getting that structure through an additional process doesn't create the ideal programming environment. The debugging process is more complicated, and resulting programs are larger and sometimes slower (as in loading arrays).

Some of the benefits provided by MetaBasic are also degraded because it's an added step. One of the advantages of modules is that they can be tested and debugged separately from other parts of a program. In order to do this with a MetaBasic subprogram, you'd have to write a special, small main program that did nothing but call the subprogram, a minor annoyance. Also, the readable documented programs you create are in MetaBasic source code, perhaps understandable to other programmers,



but not transportable. The actual Basic programs themselves, which are transportable, aren't easily understood.

Despite these mostly inherent faults, MetaBasic is a well-planned and flexible product. If applications had personalities, this one could certainly be called reasonable and friendly. MetaBasic statements have a logical, consistent syntax and nice features. Passing whole arrays, Metarecords or fields from Metarecords to subprograms, and the repetition multiplier in the Metadata statement are examples. The Metaendif and random file I/O statements are worth mentioning again. And then there is the subjective value of structured, modular programming.

I suppose whether you should buy MetaBasic depends on what kind of Basic programmer you are. If your style is quick and dirty, or if a library of reusable subroutines doesn't mean much to you, then you won't be interested. There will be too much overhead in cost and time to make it worthwhile. If, however, you're a programmer with a long-range view who hoards subroutines, modifies programs often or appreciates structured programming, then you should consider MetaBasic.■

MetaBasic, version 1.0

System Requirements: IBM PC or compatible; PC DOS 1.0, 64KB; DOS 2.0, 96KB; one disk drive; either black and white or color display; printer suggested.
Manufacturer: Software 128, 363 Walden St., Concord, MA 01742.
Price: $75.

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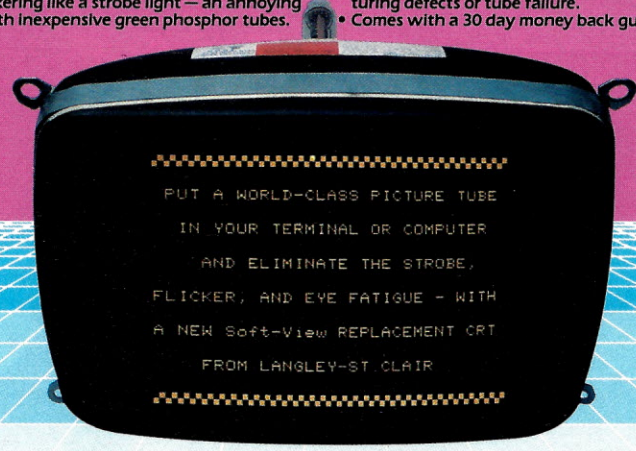

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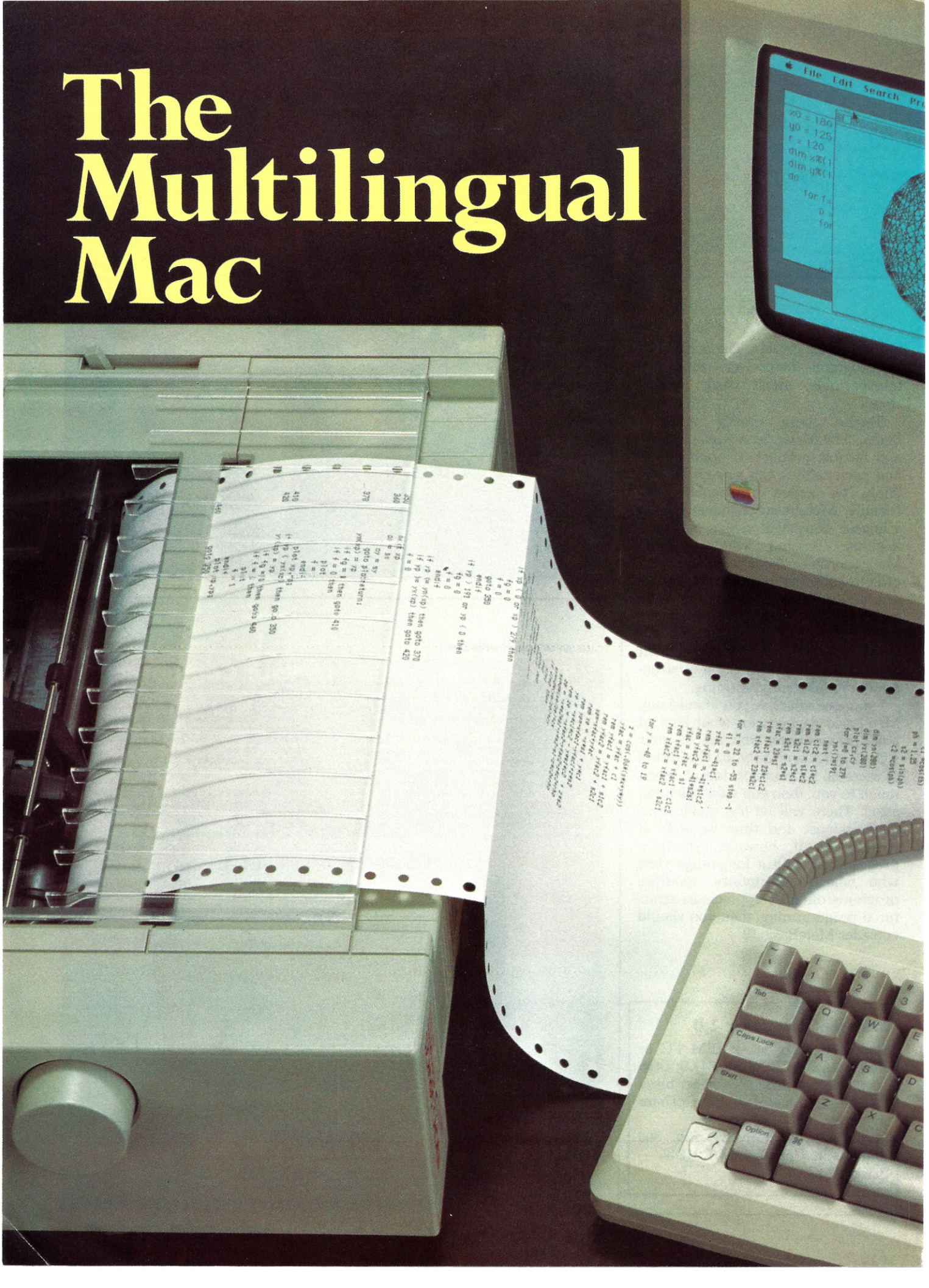
The Multilingual Mac



By Jim Heid
Senior Technical Editor

Programming languages haven't changed much over the years. Programmers face the same problems they've always faced. However, Mac may have something to say about that. Macintosh Basic, Macintosh Pascal and Macforth offer impressive programming environments. Senior Technical Editor Jim Heid ran the trio through their paces and in this article, he reports his findings. (He also reports a severe case of mouse cramp.)

It's been a long time since I've said "Gee, whiz" over a programming language. Sure, new languages enter the scene and existing languages are extended and improved, but the task of crafting a computer program hasn't become much easier in the last 20 or so years. Programmers are still faced with line-oriented text editors, with languages that require line numbers, and with so-called trace functions that simply vomit line numbers all over the screen.

Apple's Macintosh may change all that. The same exceptional window- and mouse-oriented user interface that's making software easier to use for neophytes will make experienced programmers more productive and beginners less frustrated.

For test purposes, *Microcomputing* was given prerelease copies of Apple's Macintosh Basic and Think Technologies' Macintosh Pascal; the final versions may differ slightly from what's described here. The copy of MacForth I received was a final ver-

sion, although it contained several small glitches that should be fixed.

One Mac language, Microsoft's Basic, isn't covered here since we reviewed it in our April issue (see *Microcomputing*, April 1984, page 38). Microsoft is working on a new version of the language, however, which we'll review as soon as it's available.

The most distinctive feature of the Mac languages is the programming environment—the text editing and program debugging tools—that each offers. The languages themselves are, with the exception of Macintosh Basic, very similar to their predecessors.

Macintosh Basic

Macintosh Basic, developed almost single-handedly over a two-year time span by Apple's Donn Denman, is my favorite of the three Mac languages discussed here. Besides providing a slick environment that makes program editing and debugging a pleasure, the language's new functions and features will make a Basic Believer out of the most steadfast structuralist.

When you activate Macintosh Basic, you're presented with a menu bar containing File, Edit, Search, Program and Data menus (see Fig. 1). The File menu contains options that let you create, open, close and print Macintosh Basic files. The Edit menu lets you undo the most recent editing command and lets you cut, copy and paste text to or from the Mac's Clipboard. The Edit menu also has an option, called Copy Picture, that copies any graphics in a program's output window (described later) to the Clipboard.

The next menu, Search, is the doorway to Mac Basic's search-and-replace features. You can look for or replace a character string in your program. You can also specify whether the case (upper or lower) is significant, and whether the desired string is a separate word or embedded in other words.

The Program menu lets you run a program and halt and resume its execution. With another option, you can save a program's intermediate code (described later). Two more options, Update and Debug, let you invoke Macintosh Basic's debugging features. The Update option lets you alter your program *while it's running* and immediately see the effects of your changes. The Debug option turns on Mac Basic's debugger, also described later.

The Data menu provides a unique set of options so you can edit and manipulate text files. Its options include Open Data File, Lock File (protects a file), Unlock File (unprotects it), Delete File and Save Output (saves a copy of the output window to disk).

No Data menu commands were implemented in my version of Mac Basic, so I can't comment on them,

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I'm not quite as enthusiastic as the documentation is, but I'm close. The Mac Basic debugger will be excellent.

except to say that the idea is great. Many Basic programmers have gone over the edge trying to figure out which comma caused their program to crash with an Input Past End error. Being able to view your program's data files as they're created can save loads of debugging time and a lot of frustration.

De Editor and Debugger

The language's full-screen text editor makes writing and editing your Mac Basic programs easier. The editor operates much like other Macintosh text editors, relying on the mouse completely for cursor movement. You select text by "dragging"—moving the cursor while pressing the mouse button. Text that you delete is sent to the Mac's Clipboard; from there you can paste it into other documents or programs.

"The debugger asymptotically approaches insanely greathood, and promises to be the solution to most major world problems. Trust me on this one."

Those aren't my words; they're from the prerelease documentation that accompanied my copy of Mac Basic. I'm not quite as enthusiastic, but I'm close. The Mac Basic debugger will be excellent.

The debugger's design wasn't complete when this article was written, but this much is known: When you activate the debugger, your program listing will appear, with line numbers added for reference and with a little finger pointing at the line that's about to execute. Other windows will appear showing any variables in use and their values as well as providing a list of the labels in your program. You'll also be able to insert breakpoints that halt program execution at specified points, and you'll be able to single-step through your program while the little finger points out the way.

Compiled or Interpreted?

Yes. When you press return after typing a program line, Mac Basic immediately checks the line for syntax errors and compiles the line into an intermediate code, called a byte code (or b-code, for short). Later, when you run the program, the b-code is interpreted. This combination of compiler and interpreter gives the language the speed and performance of a compiler, with the interactive debugging advantages of an interpreter. (See the sidebar, "Benchmarking Mac Languages.")

There are other advantages, too. First, since program lines are condensed into b-code, you can use remarks, indentation and long variable names in your programs without worrying about slowing execution speed (Denman says that a well-commented 300KB source file shrinks down to about 20KB of b-code). Second, you can save the b-code on disk, which, besides using less disk space than the source code, means that your program can't be listed or modified.

Mac Basic leaves 30–40KB of memory free for your program text. If that's not enough, you can divide your program into modules and use the Call statement to pass control (and variables) from one module to the next.

No Pains, Big Gains

In describing his approach to designing Macintosh Basic, Donn Denman told me, "I tried to remove the things that made Basic a pain to work with." He succeeded. Mac Basic's impressive features eliminate Basic's biggest drawbacks.

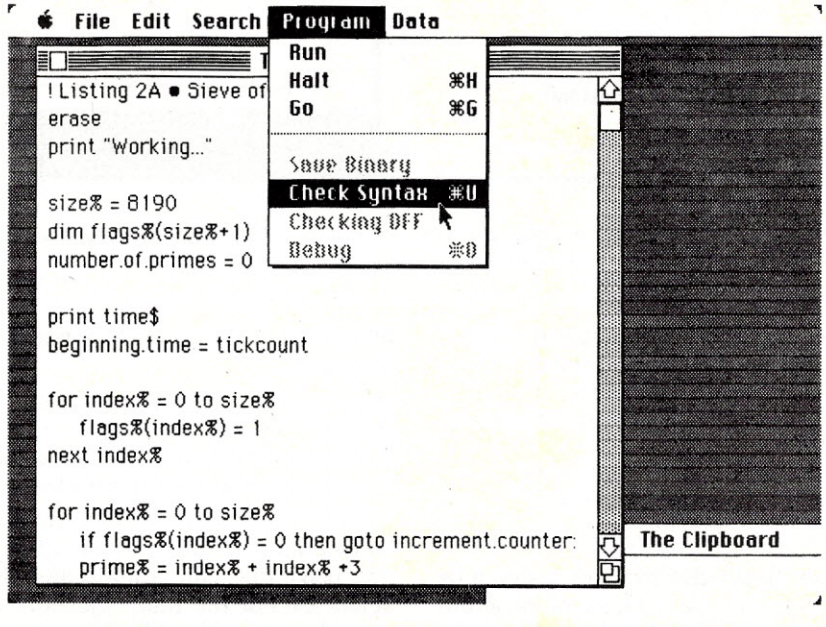
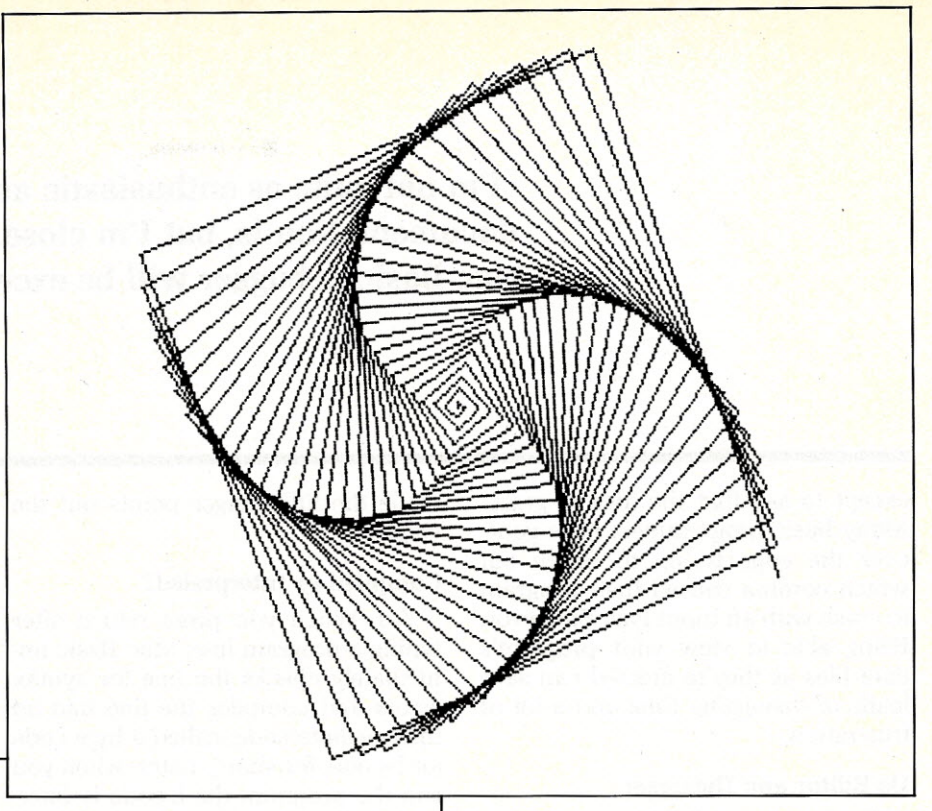


Fig. 1. Macintosh Basic's environment. Here, the Check Syntax option is being selected.



The first thing you're likely to notice about a Mac Basic program is the lack of line numbers (see listings 1A–4A). Line numbers are optional in Mac Basic. If you use them, Basic treats them as labels rather than as numbers in a series. This means that line numbers need not be sequential,

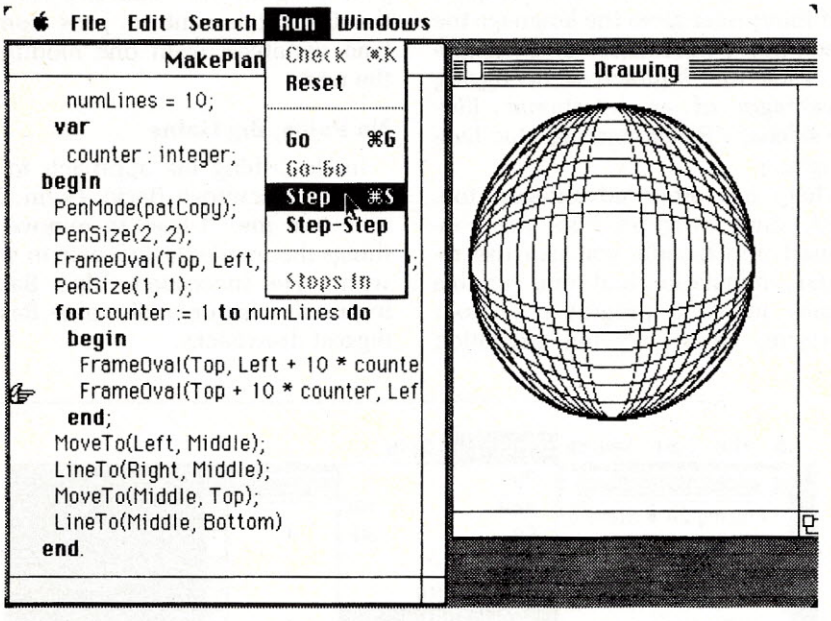


Fig. 2. Macintosh Pascal's environment. Here, the system is single-stepping through a program. Note the pointing finger denoting the line that will execute next.

which could lead to programs like:

```
5 print "We're starting count-down"
4 print "Countdown proceeding"
print "Let me interject this line, without a
number"
3 print "Three seconds and counting"
2 print "Ignition sequence started. . ."
1 print "We have ignition"
print "Lift-off!"
```

Mac Basic also lets you assign a label to a line or a block of program code. You can use labels to add readability to your programs by writing, for example:

```
input "Do you want to read any more" ;
answer$
if answer$ = "YES" then goto congratulate.
on. good. taste else goto well. excuuse. me.
```

Label names (and line numbers) can contain as many characters as you need, and can contain any characters except the math symbols, the remark character (the exclamation mark), commas, semicolons or spaces.

Each Mac Basic program line can contain only one statement, as opposed to most other Basic dialects, which allow multiple-statement lines as long as each statement is separated by a colon.

Other Features

Here's a summary of the language's most significant features:

- Multitasking. Mac Basic can run any number of Basic programs at once by dividing up processor time (in 1/60 second increments) between each one. Of course, the more programs you have running, the slower the system is. Still, it's exciting to be writing a program in one window while other programs are executing in their own windows.
- Interactive object support. In the Macintosh environment, things like pull-down menus and dialogue boxes are called interactive objects and are controlled by an extensive library of ROM routines called the Toolbox. Using Toolbox routines, you can write programs that look and operate much like professional Macintosh applications. Your program still runs under the Mac Basic environment, however, meaning that Mac Basic's menus and windows remain. You won't be able to do full-fledged Mac software development, but at least you'll be able to write Basic programs

The biggest catch is incompatibility. Mac Basic's whiz-bang features will never work on anything but a Mac.

that take advantage of the Mac's user interface.

Mac Basic handles interactive objects on an interrupt-driven basis. When you write your program, you tell the computer what it's supposed to do if, for example, the user selects a particular menu. After that, whenever the menu is selected, program execution branches to the portion of code that handles the event. It's as if the program is operating in an endless loop, always checking to see if certain conditions are true.

●Extensive graphics and mouse support. Mac Basic gives you access to most QuickDraw graphics routines in the Toolbox. Commands exist that let you draw lines, circles, boxes, rectangles and rectangles with round corners, in either normal (black on white) or inverted (white on black) modes. You can also plot individual pixels (using the Plot command), and you can change the size of the pixels using the Pensize command. You also have access to all Macintosh type sizes and styles.

Mouse-oriented commands include MouseH and MouseV, which return the horizontal and vertical coordinates of the mouse pointer—and MouseB, which you use to determine whether or not the mouse button is being pressed.

●New data types. Mac Basic offers a picture type (denoted by the @ symbol). Picture variables store graphics images that can be moved around the screen, loaded to or from Mac Paint files and so on. Mac Basic also adds a Boolean (true or false) data type.

The conventional data types, integer, real and string, are also enhanced. Long integers have 18 digits of accuracy; extended precision real types have 18 digits of accuracy as well. You can also specify a value range when dimensioning an array. For example, DIM TEENAGE(13 TO 19) sets up an array called TEENAGE that stores only values from 13 to 19. An error occurs if you try to assign a number outside of this range.

●Multiline user-defined functions. This feature was still in the early planning stages, so I can't say much about it, except that you'll be able to define complex functions and pass variables to them.

●New control structures. Be gone, goto! With Mac Basic's new control structures, your programs can be better structured and more easily read. A multiline if...then...else lets you do things like:

```
if steak = burned then
  mood = angry
  waiter = no.tip
  gosub the.local.diner:
else mood = pleased
  gosub chow.down:
endif
```

A Select Case construct blows its predecessors, on...gosub and on...goto, out of the water. Consider this:

```
select case bar.line$
  case "What's your sign?"
    gosub not.interested:
  case "My place or yours?"
    call the.bouncer:
  case "Is this seat taken?"
    gosub bathroom:
  case "Hi"
    gosub get.to.know.better:
endselect
```

●String manipulators. Besides the usual Mid$, Right$ and Left$ functions, Mac Basic features a Format$ function that's similar to Microsoft Basic's Print Using. Donn Denman also spoke of a Replace$ function, which would presumably operate much like Mid$ does when it's used on the left side of the equal sign.

●Data file structures. Here's another area of the language that wasn't completely defined. It's expected that Mac Basic will have three data file types: sequential (same old stuff), relative (also called random-access), and stream, an unformatted, byte-oriented I/O technique with which you simply write stuff to the disk without concern for record lengths, fields and all the other headaches that make data file programming so difficult.

●Sound support. Denman had originally intended for Mac Basic to completely support the Mac's four-voice sound generator. Unfortunately, quickly approaching deadlines forced some trade-offs. Mac Basic will support sound, but you'll only be able to access one voice at a time, probably through a Beep statement with duration, volume and pitch parameters. For four-voice sound, you'll have call assembly language. (Denman claims that future releases will better support the sound generator.)

What's the Catch?

The biggest one is, of course, incompatibility. A Basic program written using Mac Basic's whiz-bang features will never run on anything but a Mac (or a Lisa running in Mac emulation mode). By the same token, most existing Basic programs don't stand a chance of running under Mac Basic, although a moderately proficient programmer could modify them.

Most Mac programmers won't consider this a big drawback, however. The Macintosh and Mac Basic offer so many improvements in the user-interface department that I wouldn't want to convert my "Type 1 to add new data, 2 to review old data" database program to Mac Basic anyway, not without giving some serious thought as to how I could improve the way the program converses with its user.

Macintosh Basic is a whole new programming language, full of rich

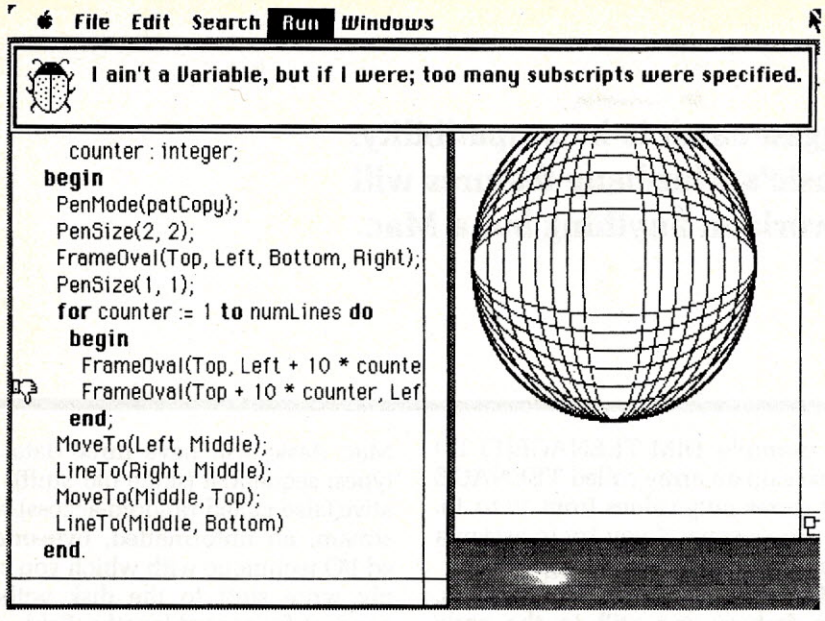


Fig. 3. A Macintosh Pascal error message. I'm sure the "ain't" will be a big hit with educators.

time, well, it's back to editor again. Frustration is the rule.

Macintosh Pascal's approach is entirely different. First, the language is interpreted rather than compiled. Like Mac Basic, when you type a program line, Mac Pascal checks it for correct syntax, then converts it into an intermediate code, which is interpreted when you run the program. As Singer says, "The illusion that we try to maintain at all times is that you're dealing with nothing but your source program."

The Environment

Macintosh Pascal presents five menus, plus the ever-present Apple menu (see Fig. 2). You use the File menu to load, save and print programs. The Edit menu offers the usual Cut, Copy and Paste functions, and functions and features that will make programming far easier and more enjoyable. To me, it's the perfect programming environment for Macintosh. But there are those out there who prefer Pascal or are fond of Forth...what does Macintosh offer them?

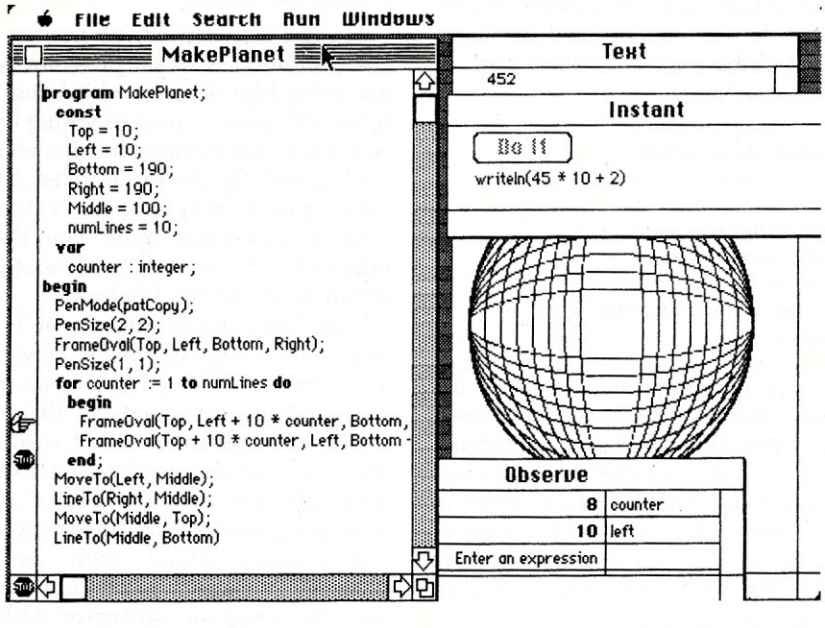


Fig. 4. Macintosh Pascal at work. Here, the Observe window is monitoring the contents of the variables Counter and Left. A breakpoint is set at the End statement with the stop sign next to it, and the Instant window has recently been used for calculation.

Macintosh Pascal

"If you take an ordinary, plain Jane language like Pascal, and put it into [a sophisticated, Mac-like environment], it becomes quite a different thing. What you're seeing in [Macintosh Pascal]...is the tiniest fraction of what we've conceived of here and what we can do. We really hope to have a tremendous impact on the way people develop software."

Those tall-sounding words are Andrew Singer's, vice president of Think Technologies (Think, for short), the Lexington, MA, firm that's developed Macintosh Pascal. First prototyped on an Apple II by Think founder Dr. Mel Conway, Macintosh Pascal is probably the friendliest Pascal programming environment around. If you've never programmed in Pascal, you'll find Mac Pascal a patient teacher. If you're a Pascal veteran who's used to S(truggling T(hrough A(wkward p-Systems, you'll be delighted by Mac Pascal's interactive nature.

A Different Approach

In most Pascal environments, you have to type your program's text using an editor. Next, you run the file through a compiler, which generates the p-code that's later interpreted when you run the program. If the compiler locates any errors, you have to go back to the text editor to correct them, then recompile. And if you didn't catch all the errors the first

Picky Pascal programmers may protest its particular "pretty printing" style. . .

the Search menu lets you find and replace text.

The Run menu offers some interesting options. Choosing the Check Syntax option causes Mac Pascal to search the current program from top to bottom for syntax errors. If any are found, a "thumbs down" is displayed next to the offending line, and an error message appears that, while not explicit, is detailed enough so you should be able to figure out where you erred (see Fig. 3). The Go option runs your program; the remaining options—Go-Go, Step, Step-Step and Stops In—are explained later.

The next menu over, Windows, gives you control over Macintosh Pascal's various windows. Its Instant option activates a handy window by the same name that lets you enter and execute a few Pascal statements by simply typing them, then clicking the mouse pointer on the Do It button. The Observe window is handier still; it lets you keep track of variable contents while a program is running. Fig. 4 illustrates the Instant and Observe windows.

The Text option activates the text window, which is where the results of Writeln statements, and any text written to the standard text file, Output, appear. The Drawing option is similar; it activates the Drawing window, which is where any QuickDraw graphics appear. Remember that Macintosh typefaces are created with QuickDraw; therefore, if you want your program to display them, it must use the DrawChar, DrawString and DrawText procedures, rather than the more conventional Write and Writeln statements.

The Window menu's Type Size option lets you choose from three type sizes—small, medium and large—for the text of your program listing. This option is especially convenient when you're debugging a program. You select the small type size, then shrink the listing window until it occupies the left side of the screen. Next, you position the Drawing and/or Text windows on the right side of the screen. You can then run or step through your program while keeping an eye on the listing and the program's output.

Step Up to the Breaking Point

The Instant and Observe windows are only two of Macintosh Pascal's debugging tools. Equally impressive are the language's single-stepping and breakpointing features. You can run a program one line at a time by selecting the Step option or by typing Command-S. When single-stepping, Pascal displays a pointing finger (like Mac Basic's) next to the program line that's about to execute. Another option, Step-Step, steps continuously, moving the pointing finger and updating the Observe window every step of the way.

To set breakpoints, you use the Stops In option, found in the Run menu. Each breakpoint you set is denoted by a small stop sign next to its program line. When Pascal reaches a line with a stop sign, it halts execution and updates the Observe window (into which you've already typed the names of the variables to be observed).

You can also use breakpoints along with the Go-Go option. When you select Go-Go, your program runs continuously, pausing at a stop sign just long enough to update the Observe window.

Compatibility and Features

Macintosh Pascal is almost completely compatible with UCSD Pascal. Both have the same data types, expression operators, control statements and input/output statements. Think Technologies placed more importance on compatibility with Apple's Lisa Pascal, however, and there are, according to Singer, "a few cases where Lisa Pascal and UCSD [Pascal] are completely at odds."

Macintosh Pascal lacks UCSD's turtle graphics package. That makes sense; the Mac has its own toolbox of far superior graphics primitives. Mac Pascal also relaxes data type rules somewhat. You can, for example, multiply a real number by an integer without generating an error; the language converts both operands to extended types before performing the arithmetic. Similarly, you can mix string, packed string and character data types in operations.

Macintosh Pascal was designed to be the ideal Pascal *learning* environment. The language automatically formats program listings, displaying all Pascal statements in boldface and indenting procedures, loops, If statements and so on. Picky Pascal programmers may protest its particular "pretty printing" style, but most programmers will be grateful that it frees them from having to worry about formatting themselves.

In keeping with its educational slant, Mac Pascal adds a large library of predefined functions and procedures that give you access to Mac's ROM-bound QuickDraw graphics package. Unfortunately, functions and procedures that let you control user-interface objects, like pull-down menus, dialogue boxes, icons and so on, are not provided.

There is a way to access the user-interface ROM routines, however. Singer calls it "a back door into the software" and explains, "we're going to give people two routes into this software: one that's the most 'protected' Pascal learning tool route, and

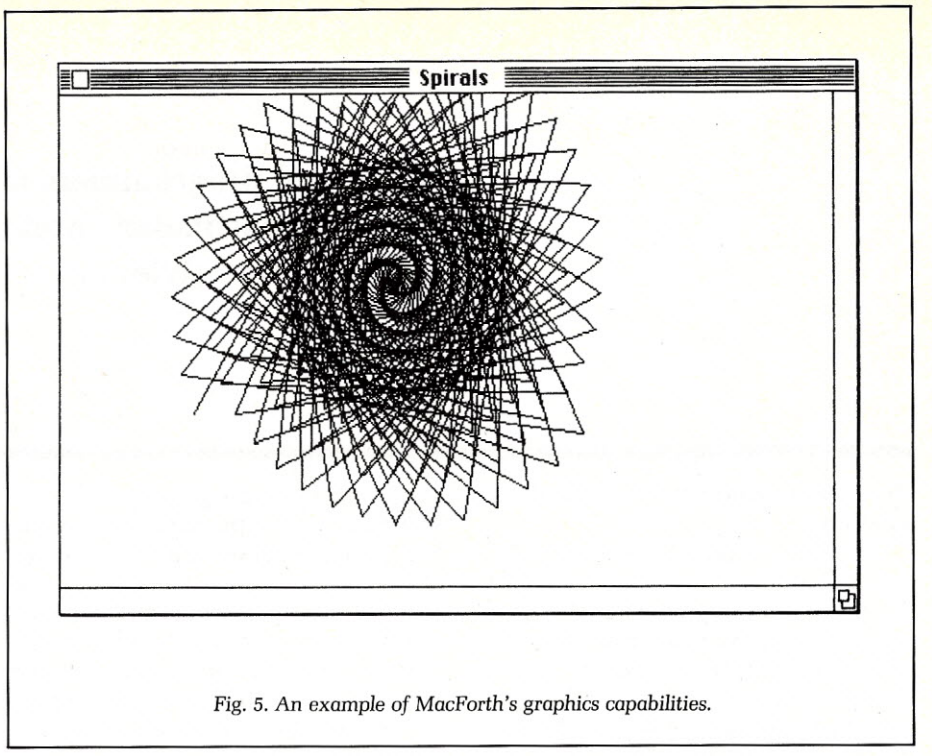


Fig. 5. An example of MacForth's graphics capabilities.

then a real hacker's route." The language provides "hooks" that will give proficient programmers access to all Toolbox routines.

For you Pascalians interested in serious applications development, Think plans on introducing a development system, probably at the end of this year, that Singer claims will let you develop "10,000- to 20,000-line programs."

Documentation

The first section of the Macintosh Pascal's manual, the user's guide, is an easy-to-understand guide to the Macintosh Pascal environment. It explains each menu's options as well as the windows and debugging features. Its style and format is very similar to the MacPaint manual.

From there, however, you're thrust violently into some of the driest reference reading you'll ever encounter. You'll be anesthetized by lines like "The ordinality of an enumerated constant is its position in the identifier list in which it is declared, where the ordinality of the first enumerated constant in the list is always zero." I had to glance back at the manual's cover periodically to make sure I hadn't picked up a medical journal by mistake.

As a reference for the experienced programmer, however, the manual is complete. The reference section is

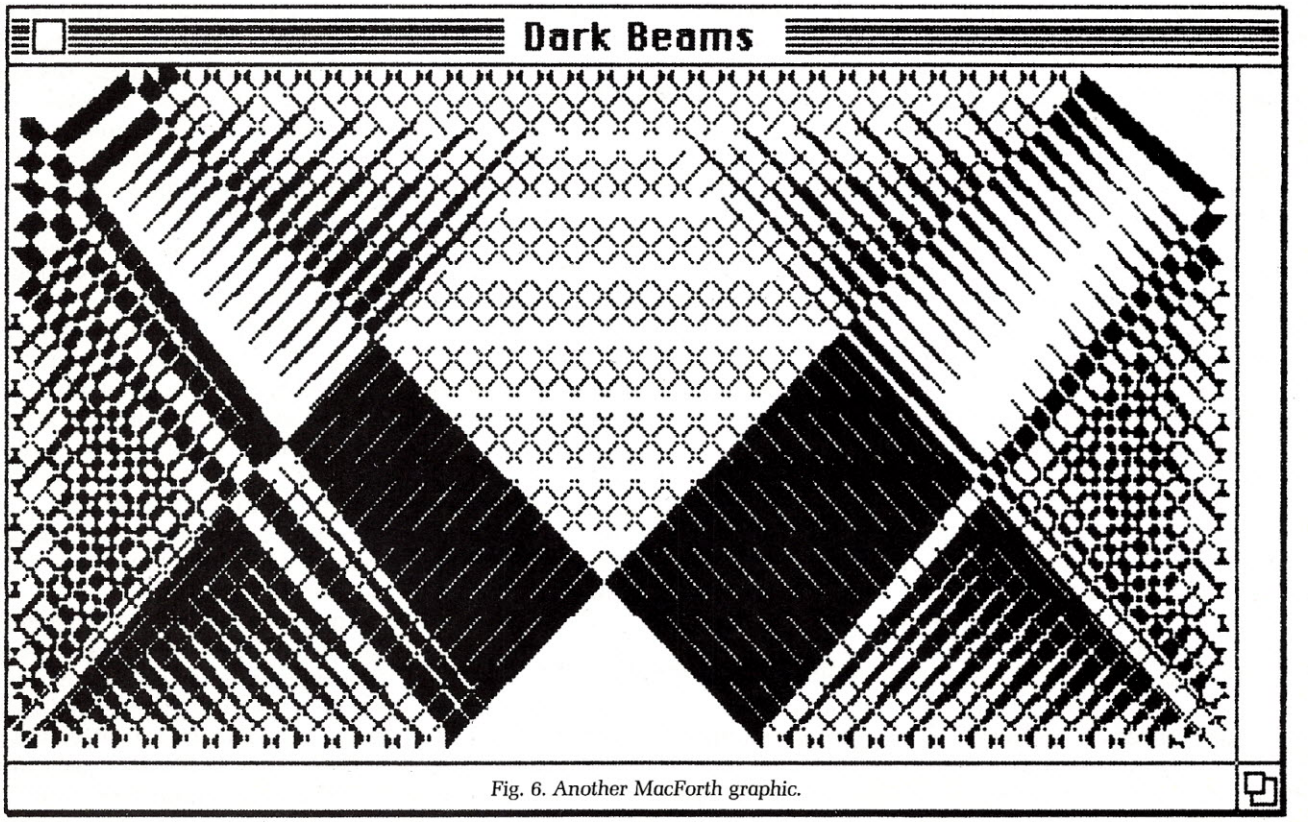


Fig. 6. Another MacForth graphic.

MacForth is a like a souped-up stripped-down stock racing car—no luxuries and little comfort, but incredible performance, *if* you know how to drive it.

divided into two parts. The first section describes the language's characteristics, while the second section describes QuickDraw routines and how they're accessed from Mac Pascal. Detailed syntax diagrams illustrate each statement.

It's a shame that the manual is so unreadable; I envision a scenario in which a would-be Mac Pascal programmer buys the language, is excited by the user's guide, looks at the reference section and runs, screaming, into the sunset, never to touch the disk or manual again. Reference manuals don't have to read like medical journals (as the preliminary Mac Basic manual proves).

Pascal Conclusions

Like Macintosh Basic, Macintosh Pascal provides an easy-to-use editor with dynamite debugging features. Unlike Macintosh Basic, however, Mac Pascal doesn't change the language significantly. It's pretty much Nikolas Wirth's baby, except with a clean diaper (the pretty printing features) and a luxurious new playpen (the environment).

Mac Pascal will be most appreciated in the education field. Pascal is fast becoming the language of choice in the classroom (the College Entrance Examination Board chose it for its programming achievement tests), and I can't think of a friendlier Pascal environment to work with.

There's one more stop in our odyssey through Mac languages—the Forth dimension.

Forth: Feet, Beware

"When you give somebody a loaded gun, you don't usually give them the caveat, 'Don't shoot yourself in the foot'—it's an unspoken thing. But you certainly do have that ability in Forth," says Christine Colburn, president of Creative Solutions Inc., developers of MacForth.

It's true, too. You can crash a Mac under MacForth with no difficulty at all. You can also draw some dazzling graphics, you can roam through the Mac Toolbox to your heart's content and you can ionize numbers (similar to crunching them, only it happens much faster).

MacForth is by far the least friendly of the three Mac languages covered here. It has no whiz-bang debugger, no little finger pointing the way through your listings, no little stop signs representing breakpoints. It's like a souped-up, stripped-down stock racing car—no luxuries and little comfort, but incredible performance, *if* you know how to drive it.

MacForth is available in three variations: the Level 1 product, which was the only version available when this was written, supports integer math only and gives you limited access to the Toolbox. You can create your own menus and you can create and manipulate windows, but you don't have access to the Toolbox routines that create dialogue boxes.

The Level 2 product ($249), which should be available by now, supports floating-point math and dialogue boxes and contains an integral 68000 assembler. With it, you can write professional-looking Macintosh applications. The Level 3 product ($2500, release date unknown), will include a run-time module and licenses that will let you distribute your creations.

May the Forth Be with You

What's interesting about MacForth is that much of the language's environment is itself written in Forth. When you run MacForth, a menu bar containing the Apple menu and an Options menu appears. Next, a message saying "Extending System...Loading Editor Routines" appears. The disk drive whirrs for a few seconds, then a new menu, called Edit, appears to the right of the Options menu.

Having a lot of the environment written in Forth has its pluses and minuses. On the plus side, you can list the source code and get a feel for what it takes to write a Macintosh application in Forth. On the minus side, some aspects of the environment are a little flaky. It's possible, for example, to shrink a window until it's so small that you can no longer access it. (Most Macintosh applications won't let you shrink a window past a certain size.) When that happens, you

```
3  CONSTANT  WORK.FILE
" My Program Blocks "  WORK.FILE  ASSIGN  ?FILE.ERROR
WORK.FILE  CREATE.BLOCKS.FILE   ?FILE.ERROR
WORK.FILE  OPEN.BLOCKS  ?FILE.ERROR
12 WORK.FILE  APPEND.BLOCKS
WORK.FILE  BLOCKS.FILE
```

Listing 1. You must run this routine to set up a Forth program file. A menu option that does it for you would have been more convenient.

have to exit MacForth, then run it again.

The Options menu lets you activate MacForth's debugging and trace features. Its other options let you turn on the printer (everything sent to the screen is also sent to the printer), activate the MacForth window (which is where you type direct commands), abort a program's execution and exit MacForth.

The Edit menu's options include the customary Cut, Paste, Copy and Undo. Its other options include:

- Stamp—marks the current block (blocks are described later) with the current date and your initials;
- Clean—fills the current block with blanks, wiping out anything that was there; and
- Revert—replaces the current block's contents with the version saved on disk.

Forth programs are written and stored in blocks; each block is 1024 bytes long. When you're ready to write a program, you have to go through a rather lengthy procedure that creates a file with enough blocks to hold the program. Listing 1 contains a typical example. It's a lot of work that could be done better and faster by the computer.

MacForth's trace and debugging features are valuable but are bland in comparison to the flashy features provided by Mac Basic and Pascal. The features, when active, display the name of the currently executing word along with the depth and contents of the stack.

Beware of Bombs

Although it was a final version, my copy of MacForth had a mind of its own sometimes. Occasionally, if I selected the Exit Editor option when the editor wasn't active, I'd get the infamous Macbomb "serious system error" message.

Benchmarking Mac Languages

To test the number-crunching abilities of each Mac language, I ran two programs on each. The first (Listings 1A–1C) is a simple empty loop that counts to 10,000. The second (Listings 2A–C) is a prime number generator that uses the ever-popular Sieve of Eratosthenes algorithm.

The winner by a knockout is, not surprisingly, MacForth. Second over the line was Macintosh Basic, while Macintosh Pascal finished a distant third (see Table 1).

Because the versions of Basic and Pascal I used weren't final release copies, it's conceivable that these times could change as each language is optimized.

Listing number and type	Basic	Pascal	Forth
1—Empty loop to 10000	0:02.5	0:04.5	0:00.46
2—Generate 1899 primes	0:31.2	1.59	:02.00

Table 1. Results of the benchmark tests (all times in seconds).

```
! Listing 1A  FOR-NEXT loop test  MacBASIC version .34
!
erase
print "Working..."
print time$
beginning.time = tickcount
    for count = 1 to 10000
    next count
ending.time = tickcount
print time$
elapsed.time = ending.time - beginning.time
actual.time = elapsed.time / 60
print "The operation took "; actual.time; " seconds."
```

Listing 1A. Empty counting loop in Mac Basic.

```
{ Listing 1B }
program empty_loop;
 var
  counter : integer;
begin
 writeln('starting');
 for counter := 1 to 10000 do
end.
```

Listing 1B. Empty counting loop in Mac Pascal.

```
( empty loop from 0 to 10000 -- Listing 1C)
: looptest
." Starting"
10000 0 do loop
." Done!"
;
looptest
```

Listing 1C. Empty counting loop in MacForth.

```
! Listing 2A  Sieve of Eratosthenes
erase
print "Working..."

size% = 8190
dim flags%(size%+1)
number.of.primes = 0

print time$
beginning.time = tickcount

for index% = 0 to size%
    flags%(index%) = 1
next index%

for index% = 0 to size%
    if flags%(index%) = 0 then goto increment.counter:
    prime% = index% + index% +3
    k% = index% + prime%

label.one:
    if k% > size% then goto found.a.prime:
    flags%(k%) = 0
    k% = k% + prime%
    goto label.one:

found.a.prime:
    number.of.primes = number.of.primes + 1

increment.counter:
    next index%

ending.time = tickcount
print time$
elapsed.time = ending.time - beginning.time
actual.time = elapsed.time / 60
print number.of.primes ;" primes generated."
print "The operation took "; actual.time; " seconds."
```

Listing 2A. Prime number generator in Mac Basic.

```
{ Listing 2B }
program sieve;
 const
  size = 8190;
 var
  flags : array[0..size] of boolean;
  index, prime, k, count, iter : integer;
begin
 writeln('Starting');
 count := 0;
 for index := 0 to size do
  flags[index] := true;
 for index := 0 to size do
  if flags[index] then
   begin
    prime := index + index + 3;
    k := index + prime;
    while k <= size do
     begin
      flags[k] := false;
      k := k + prime
     end;
    count := count + 1
   end;
 writeln(count, ' primes');
end.
```

Listing 2B. Prime number generator in Mac Pascal.

```
( eratosthesnes sieve -- Listing 2C )
 8192 constant size       create flags  size allot

: primes   flags  size 01 fill  ( empty array )
  0 ( prime counter )   size 0  ( range )
    do  flags  i+ c@
      if   3 i+  i+  dup  i+  size <  ( avoid known nonprimes)
        if  size flags +  over i+  flags +
          do  0 ic!  dup            ( flick mod prime flags)
          +loop
        then     drop 1+  ( another prime )
      then
  loop
  . ." primes  "  ;
```

Listing 2C. Prime number generator in MacForth.

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This problem is representative of MacForth's flakiness. Most of the time the system works well, but occasionally—and always when you least expect it—your Mac will go into orbit, leaving you and your would-be program back on Earth, weeping bitterly.

Creative Solutions is working to free MacForth of its glitches. It's an established company (it's been producing 68000-based Forth systems since 1979), so it's safe to assume that future releases will be glitch-free. As part of its bug-banning efforts, it's offering a bounty to the first registered owner to report a given error in the software or the manual. A software bug is worth $5, while a documentation boner gets you a buck. It's an interesting policy, and it should be effective.

A Look at the Language

MacForth is compatible with the Forth '79 and '83 standards (in fact, the Creative Solutions team acted as referees at the conventions where the standards are set) and adds a number of Mac-specific features, summarized as follows:

- Graphics and mouse support. MacForth not only supports the full QuickDraw library but adds scaling and rotation features. Several demo programs are provided that illustrate both commands. One program displays an analog-type clock in its own window. If you change the window's size, the clock's size is rescaled to fill the whole window. Other demo programs use the rotation commands to draw some beautiful geometric images (see Figs. 5 and 6) at blinding speeds.

- User interface support. As mentioned earlier, your MacForth programs can have their own pull-down menus and can create windows.

- Two file structures. MacForth offers two file types: text and virtual. A text file is a variable or fixed record length file containing ASCII records separated by carriage returns. A virtual file can contain binary and/or ASCII data in a free-form record format. You can access both file types either sequentially or randomly, and you can have up to eight files open at once.

Documentation

The MacForth documentation is complete and clear but horribly organized. The chapters are given informative names like "Getting Results" and each contains an enormous amount of information that could and should be split into a lot of smaller chapters. In the "Getting Results" chapter, for example, you learn how to manipulate windows, how to track the mouse, how to access the keyboard, how to create multiple windows and pull-down menus.

A staggering amount of information is presented in the manual, but you won't be able to find it easily; its index is far too short. Finally, parts of the manual are difficult to read, having been printed by a daisy-wheel printer with a bone-dry ribbon.

A so-called computer-aided instruction course is included on the MacForth disk. It's basically a large collection of text screens that contain short tutorials and examples that you're supposed to try. It never tests you on your knowledge, however, which is why it doesn't qualify as a true CAI course.

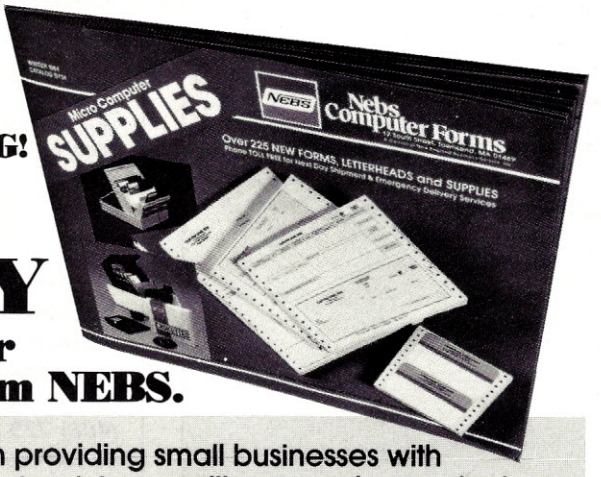
The tutorial is helpful, however, if you know nothing about Forth. It begins by explaining the Forth stack and stack-manipulation commands. From there, you're told how to display text, assign constants and variables, create word definitions and so on. The tutorial won't make a proficient Forth programmer out of you, but it will get you far enough to understand some of the Forth books that are available.

Should You Go Forth?

MacForth is for you if: you already know Forth and you want to program the Mac in it; you want to write graphics-oriented programs and need its rotation, scaling and speed advantages; you want to develop applications software on a Mac; or you're interested in crunching numbers at dazzling speeds. I would make sure that its bugs are fixed before buying, however.

If you don't fit into the above categories, I recommend Mac Basic or Pascal. Both provide much better programming environments, and Mac Basic provides more access to the Mac's user interface routines.

The languages discussed here rep-



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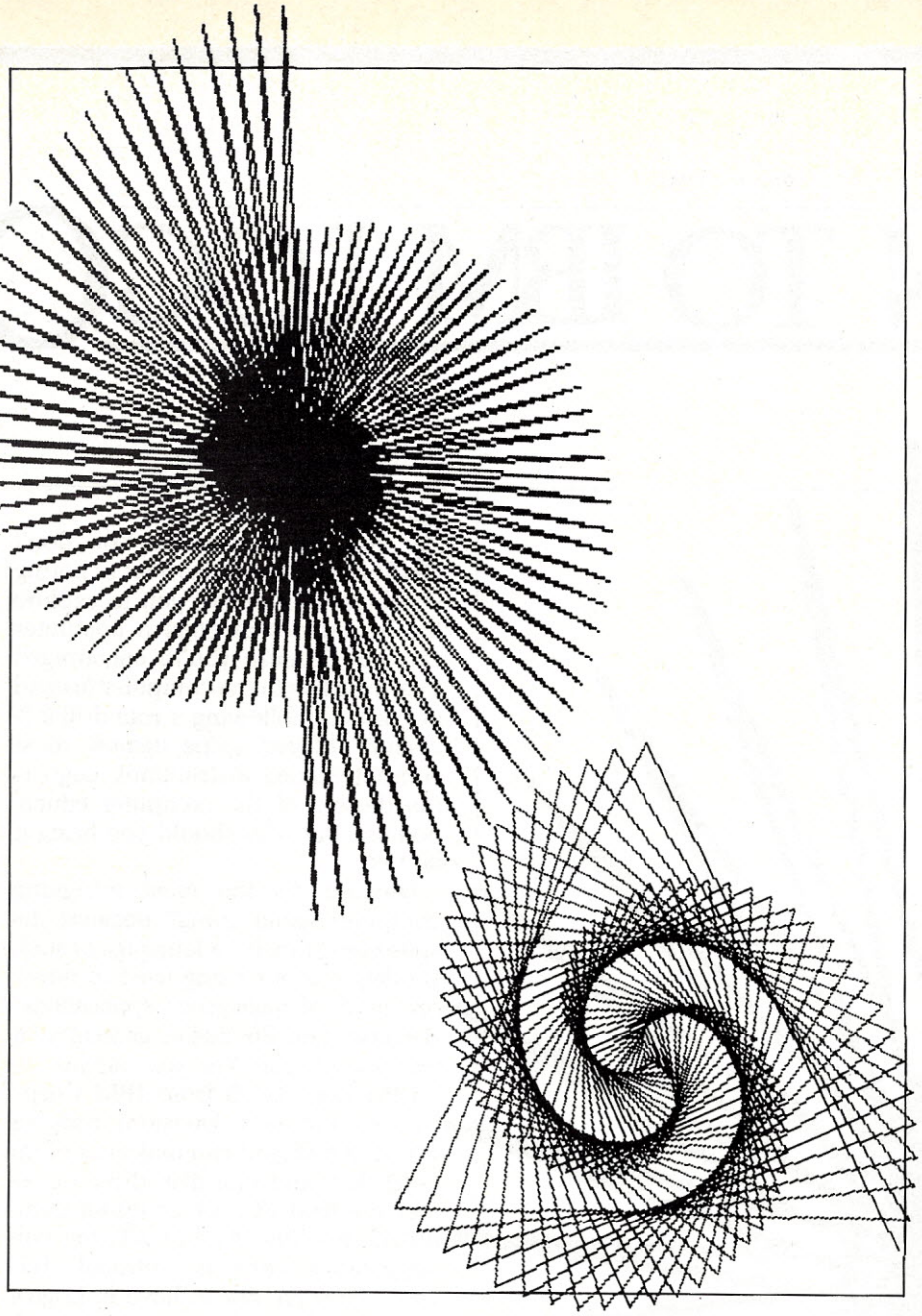

resent the beginning of a revolution in the way people program. The outstanding environments provided by the Mac languages will make expert programmers more productive and will entice more novices into programming. Now if we could just get rid of Edlin. . .■

The Macintosh Languages

	Product	
Macintosh Basic	Macintosh Pascal	MacForth
	System Requirements	
	Macintosh with one disk drive	
	Price	
$99	$125	$149
	Manufacturer	
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Dec. '83, p 22

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Jerry Pournelle, *Byte Magazine*
April '83, p 234

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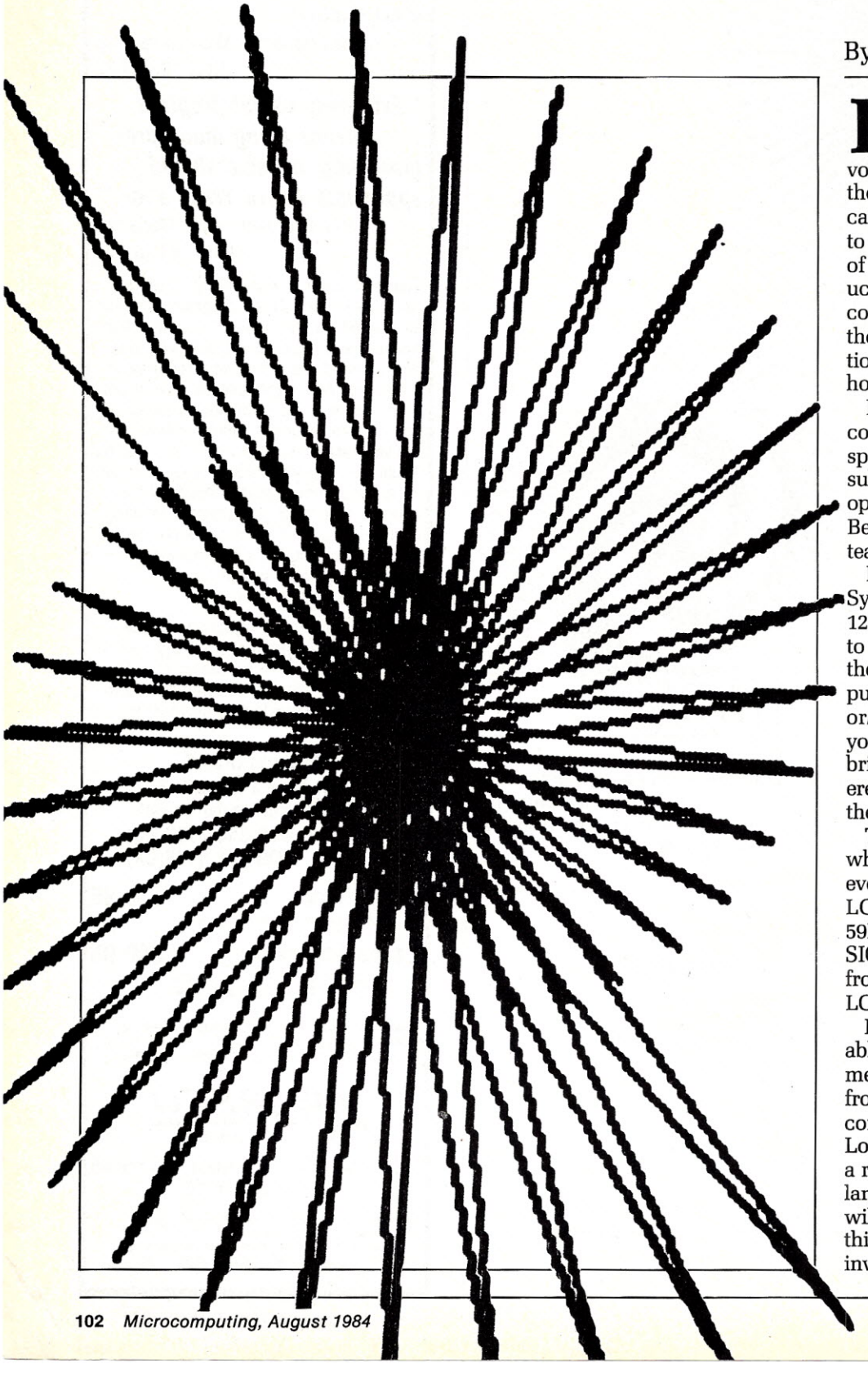


By Amee Eisenberg

Logo draws you in. You don't have to memorize a lot of boring vocabulary—it invites you to explore the boundaries of what a computer can do. Because you're encouraged to give orders to the computer instead of passively following a rote drill (educators' biggest gripe against most computer-aided instruction), Logo is the darling of the computer education set. But why should you bring it home?

Because it's the most intriguing computer game going? Because despite being fun, it's a language of such subtlety that it's being used to develope artificial intelligence applications? Because, like Euclidean geometry, it teaches thought? Yes, yes and yes.

IBM Logo ($175 from IBM Corp., System Products Division) runs in 128KB RAM (and can make use of up to 256KB) and one disk drive on either the IBM PC, XT or Junior computers. For the PC and XT, the color/graphics card is optional, but you'd be sorry not to have it. Logo's bright yellow package contains a reference manual, a tutorial manual and the Logo language disk.

The Logo disk is unprotected, which means you can put Logo on every disk you own, just like Basic. LOGO.COM takes approximately 59KB, about twice the size of BASICA.COM; like Basic, you start it from DOS by calling its name—type LOGO and press the enter key.

Logo is immediately more personable than Basic. It initializes with the message "Welcome to Logo." Apart from being friendly, this message contains a clue to the nature of Logo. Logo is a place; "Welcome to Logo," a road sign that says you've entered a land where turtles carry pens and willingly follow your instructions. It's this concreteness that makes Logo so inviting.

Logoland

We learn about our world by manipulating our environment, child psychologist Jean Piaget theorized. We learn about language by manipulating words. Starting with telegraphic statements of one or two words—babytalk—we build to a complex use of language by assimilating underlying grammatical structures. Although the rules stay the same for all speakers, you recreate your language to fit your experience.

A child seeing something new may not have the language to describe it, yet the human need to conceptualize experience will lead to the creation of the language to express it. For example, a child I know was at the circus for the first time. Upon seeing a performing bear, she said, "Look at the teddy bear." She had used something in her experience—a teddy bear—to explain something new to her—the live bear. Another example of this process is in the phrase "horseless carriage," the name first used for the automobile. Here again, something known was used to describe something unknown.

Artificial intelligence researchers at the Massachusetts Institute of Technology (MIT) decided to create a computer language around these natural learning methods. Their parameters were that the language should be discoverable through concrete manipulations; it should have certain set building blocks or primitives; and it should allow you to recreate the language according to your experiences. Logo is the result.

In MIT's lab, Logo's developer Seymour Papert and colleagues implemented the language to control round robots that they called "turtles." Programmed by simple commands, the turtles moved around the lab. The direct connection of the turtle's concrete actions to the abstractions of the language made learning Logo fun and simple. In bringing Logo to the microcomputer (and into homes), the robot turtle became a triangular cursor on your video screen.

You can give instructions to the turtle using one- or two-word statements or more complex structures. Logo's basic vocabulary consists of words called primitives. Primitives can be combined into procedures. By defining procedures, you create a language with which you can manipulate in Logoland.

Have Pen, Will Travel

Primitives like Forward 10 and Right 90 move the turtle forward ten "turtle steps" and turn it 90 degrees. If the turtle (who always carries a pen) has its pen down, it draws a line to mark its path.

Turtles draw pictures by following your instructions. You execute these pictures in an immediate mode (every instruction is performed as soon as it's entered) or in a delayed mode (a list of instructions is chained together to form a procedure). Once defined, you can use a procedure to form other procedures.

For example, you can draw a triangle using two primitives: Forward (abbreviated FD) and Right Turn (RT). In immediate mode, you tell the turtle to go forward 100 steps, then turn right 120 degrees. Then you repeat these instructions three times.

Or, you can teach the turtle to "triangle." The procedure looks like this:

```
TO TRIANGLE
FD 100 RT 120
FD 100 RT 120
FD 100 RT 120
END
```

Now, to draw a triangle, all you do is type TRIANGLE and the turtle draws a triangle. What's more, you can use the word triangle in other procedures, and the turtle will understand. For instance, to draw an iron cross, you can use this procedure:

```
TO CROSS
TRIANGLE RT 90
TRIANGLE RT 90
TRIANGLE RT 90
TRIANGLE RT 90
END
```

Thus, Logo allows you to build on your experience. As you become a more advanced user, you'll learn that Logo contains the primitive Repeat. Now you can create a cross in one statement. For example:

```
TO CROSS
REPEAT 4 [TRIANGLE RT 90]
END
```

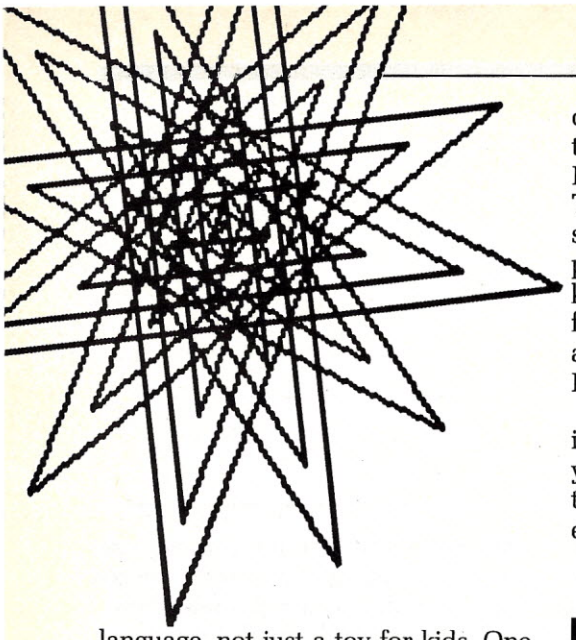
Of course, something's happening here that goes beyond pretty pictures—you're learning Logo's underlying grammatical rules. From the turtle graphics syntax, you can generalize to all Logo syntax. For example, things outside brackets act upon things inside brackets.

Just as important, the procedures you create become part of your environment, allowing you to build complex procedures from simple ones. Triangle is the basis for Cross. The more vocabulary (procedures) you have, the more easily you can communicate complex ideas.

Why IBM Logo?

Logo has been around the lab for about 20 years. Its recent increase in popularity is due to the expanded abilities of microcomputers. Now that micros have become so smart, Logo can come home.

IBM's implementation of Logo is sophisticated, easy to use and "for real." Because you begin with turtletalk, you sometimes forget that Logo is a useful, high-level programming



language, not just a toy for kids. One beauty of high-level languages is their transportability—the same software can run on different hardware.

Logo Computer Systems Inc. (LCSI) wrote IBM Logo after it had done versions for Apple, Texas Instruments, Coleco, Atari and Digital Equipment Corp. (DEC). (And one's in the works for Apple's Macintosh, I hear.) This means that a Logo program written for one can be used (with only minor changes) on the rest.

Documentation

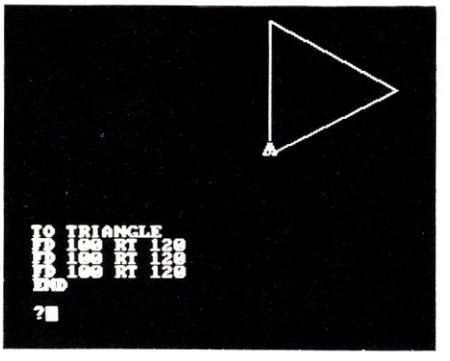
The manuals provided with IBM Logo are excellent. The *Logo: Programming with Turtle Graphics* tutorial is spiral bound, easy to read and has you off and programming faster than a hare. One especially nice feature is the Bug Box, where the authors try to troubleshoot any potential programming problems. This thoughtful approach to documentation helps you make progress on your own.

Another praiseworthy aspect of this tutorial is its organization. You learn to make the turtle do a lot of neat things, and then, just as you begin to get tired, you learn how to save it all to disk, so you can turn off the computer and go to bed.

The *IBM Personal Computer Logo Reference* (hereafter referred to as the manual) is logically organized, chock full of examples and carefully cross-referenced. It's in a loose-leaf binder so it stays open to the page you're reading. The main body of the book is the alphabetical listing of each Logo primitive. Listings include each primitive's definition and format. Set off in green type are clear examples of how the primitive is used.

Also included in the manual is an overview of the language, an explanation of the editor, tips on developing Logo programs and a reference card. The card is a handy-dandy quick source of information on what each primitive does, which is great if you know what you need to do but have forgotten the primitive (Table 1.) It's also a fine fast introduction to IBM Logo's potential.

The card divides Logo's primitives into 12 categories. (See Table 1.) As you can see, Logo is much more than turtle graphics. It allows control of every aspect of the computer.



Finally, the manual has six appendixes, covering such stuff as error messages and memory allocation, and a glossary and index.

I commend the authors; this manual is easy to understand without being simplistic. The authors were careful to explain why a subject may be of interest as well as what it is about. For example, the appendix on memory allocation states: "Some Logo users may wish to know how space is used in Logo and how to conserve it. In general, saving space is not something you should worry about."

Terrific...now you know why they are talking about it and whether it's important to you. If you've just had an "Absolutely Out of Space" message flash on your screen, you're going to keep reading.

Error Trapping

Here's when your love affair with IBM Logo might really begin. Instead of those cold, impersonal gripes that Basic utters when you've made a mistake (Syntax Error or For Without Next), IBM Logo tells you about what's gone wrong and how to change it. "I Don't Know How To Triangel" it might say if you mistyped the name for procedure Triangle. "Triangle Doesn't Like Love As Input," it might say if you typed TRIANGLE LOVE when calling the procedure Triangle.

Not only does IBM Logo speak in the first person, it also displays the line that contains the error. This makes debugging procedures a fairly simple process.

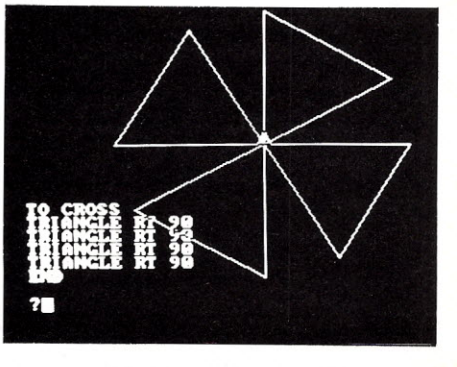
Other Neat Stuff

IBM Logo comes with a set of tools; these are procedures that do things like obtain the absolute value of an input number or run a list of instructions forever. The set is quite diverse and gives you the wherewithal to accomplish many tasks with little effort.

File handling with IBM Logo is quite sophisticated. You can save both the code for procedures and resultant screen displays. Saving and loading the display rather than executing the procedures means you don't have to wait for the turtle to redraw the screen. Logo also handles data files. My favorite, though, is the Dribble file.

Dribble files give a record of the interactions between the computer and you. This can help teachers understand what their students have been doing at the computer. The example of a potential error message involving Dribble files is wonderful. You ask the computer to output the dribble to the video display with the command DRIBBLE "CON. The computer replies "Can't Dribble On Screen". The command No Dribble stops the dribble process. Will this work on infants too?

Machine language subroutines can be added to your programs. If your computer has more than 256KB RAM, these subroutines take advantage of this memory that's otherwise inaccessible to IBM Logo.



The Bottom Line

When it comes to Logo, the IBM PC, XT and PCjr owner can choose between at least two versions of the language. IBM Logo is a complete, well-documented package. I enjoyed working with it. Since I haven't worked with any other package implemented for IBM micros, I can't make a comparative statement, but a better package is hard to imagine.

But, deciding to buy IBM Logo is the second choice you make; the first is deciding to learn Logo at all. Basic, after all, is built in to your computer and is the *de facto* standard language on microcomputers. However, you might choose Logo because of its elegance.

Basic lets you control a computer and, for lack of a better word, it's called a language. Logo is truly a language; it's easy because it's designed to be learned in the way that humans naturally learn. Once you grasp the underlying grammar, you can restructure the language to express your goals with the computer.

There's a generally accepted esthetic to language—poetry is a "prettier" way of communicating than prose—and that some languages are more poetic than others. It may be that Logo will open up programming to this same esthetic.■

Address correspondence to Amee Eisenberg, Technical Editor, jr, 80 Pine St., Peterborough, NH 03458.

Logo Quick Reference Card

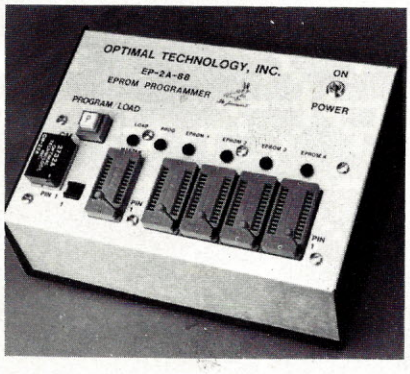
Turtle Graphics
Words and Lists
Variables
Arithmetic Operations
Defining And Modifying Procedures
Flow of Control
Logical Operations
Communicating with the Outside World
Text and Screen
Workspace Management
Property Lists
Assembly Language
Primitives (Infix Form)
Special Keys
Special Words
Color

Table 1.

IBM Logo

System Requirements: IBM PC, XT or PCjr; 128KB RAM; one disk drive; color display preferred.
Manufacturer: IBM Corp., Systems Software Division, PO Box 1328-C, Boca Raton, FL 33432.
Price: $175.

Circle 29 on Reader Service card.



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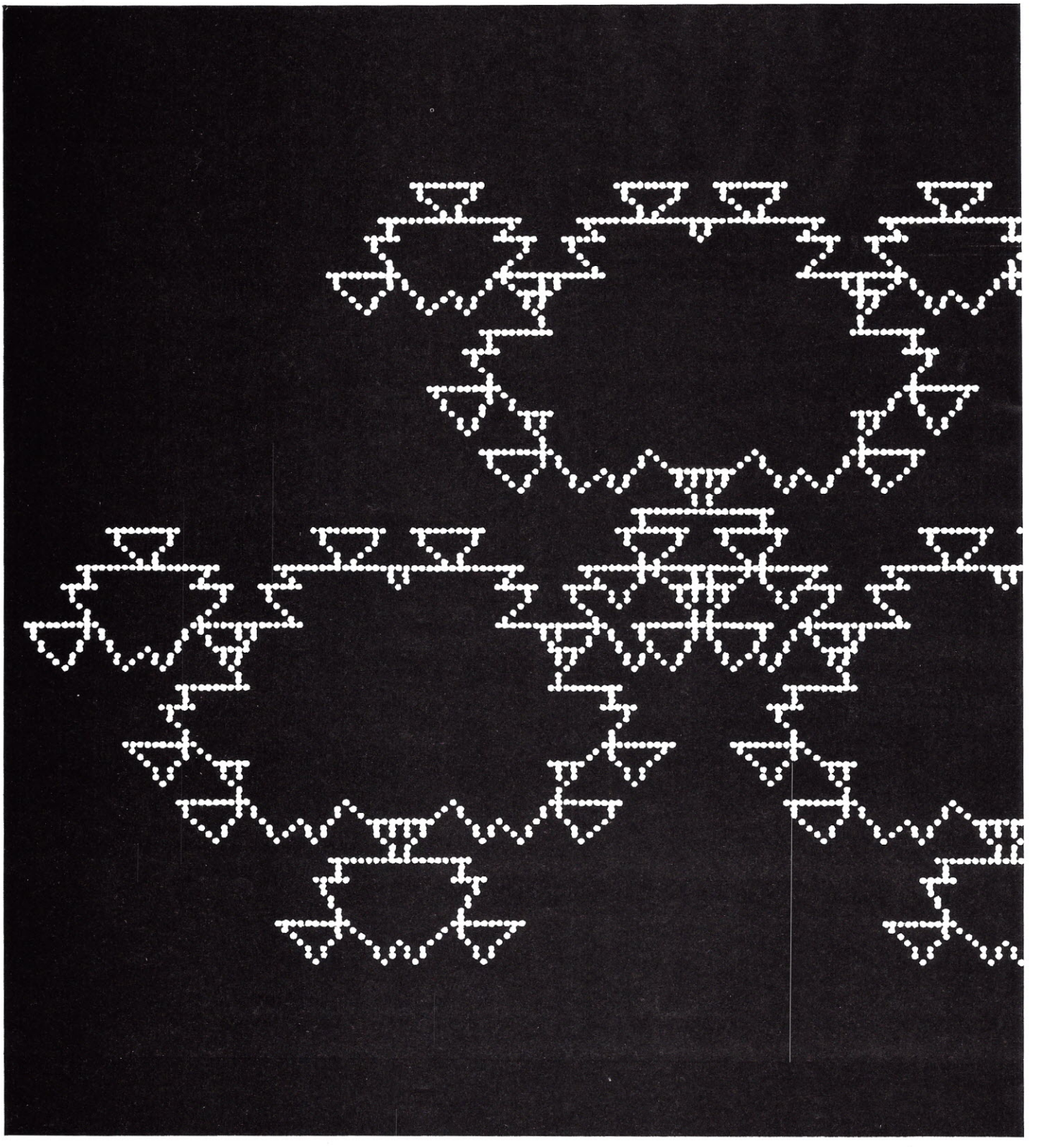
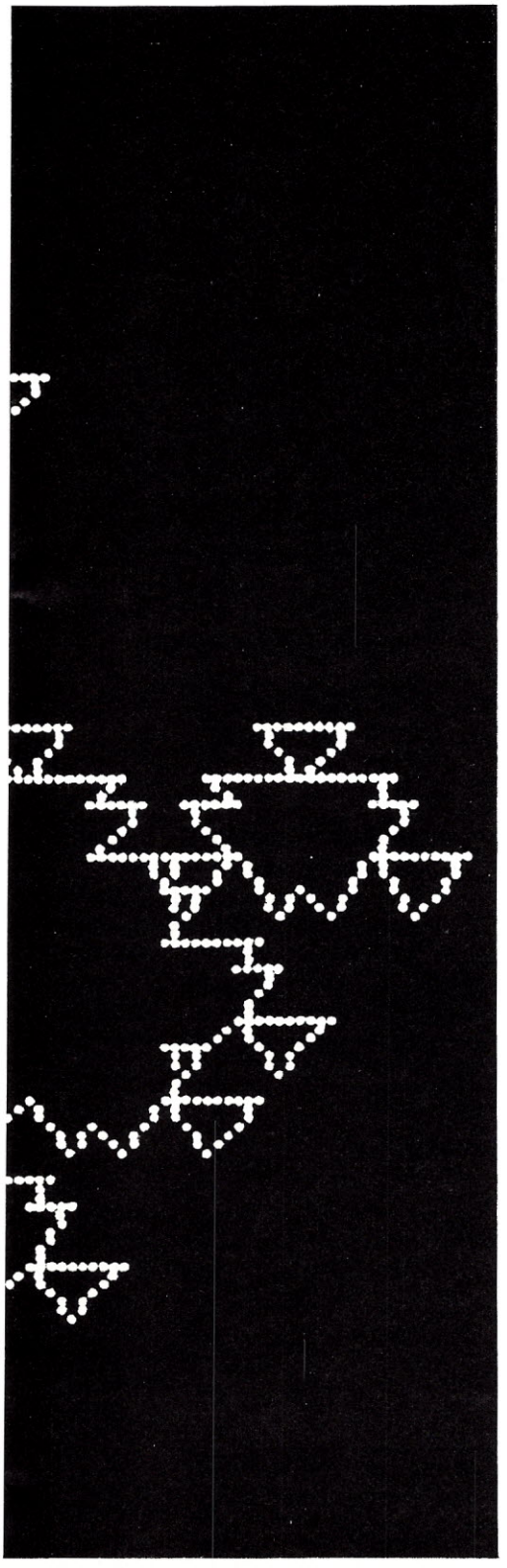
APPLE LOGO II: A LEARNING EXPERIE



NCE

By R.W.W. Taylor



A computer language represents a window that shows only a certain portion of the true nature of the computer, and different languages may well show quite different pictures.

There are few computer languages as different from Basic as Logo is and any attempt to do some serious (i.e., interesting) programming in Logo discloses whole new powers of the computer. This is likely to force programmers into some fundamental rethinking of their conception of programming. Imagine a language in which drawing a pentagon on the hi-res screen is trivial and converting a sentence into its Pig Latin equivalent is easy, but in which it isn't particularly easy to add up a list of a thousand numbers!

Immediate Gratification

Logo is an excellent language for learning how to control a computer. A wide range of short commands that produce gratifying effects can be typed in directly in immediate execution mode ("at top level," in Logo parlance). You can easily create simple procedures involving only a line or two of primitive commands, producing even more gratifying effects. Furthermore, since procedures can call other procedures (and even call themselves), it isn't long before even novice Logo users find themselves erecting intricate Tinkertoy constructions that delight the eye, the ear and particularly the mind.

Logo II is a good starting point for a study of the fascinations of Logo. With this product, Apple has taken a decisive step and has broken with a part of its past. Logo II was written for use with an Apple IIc or a beefed-up Apple IIe and requires 128KB of memory. (Sorry, guys, but it just won't run on an Apple II Plus!) The full IIc/IIe keyboard is nicely used in the design of the screen editor, with many open-Apple key combinations called on to relieve the overworked control key. All that memory is really needed in order to build in a reasonable part of the power of the language while still providing you with an adequate amount of working room.

It is instructive to compare Logo II with the first-generation implementations of Logo for the Apple (see Table 1). A good representative of the latter is version 1.3 of Terrapin Logo. The larger number of primitives, the trebled workspace size, the ability to use both upper- and lowercase letters in text displays and access to 80-column screens makes the design of far more sophisticated applications possible—and even easy.

Add Some Genius

The Logo language was created by Seymour Papert and others in the late '60s, from one part APL, one part Lisp and one part native genius. From APL he took the concept of a "workspace"—an area of memory in which numerous user-defined procedures and data items can coexist and interact, allowing a strongly modular approach to programming. From Lisp he took the idea of using lists as the basic data structure and recursion as the basic control structure of the language. Native genius led Papert to build in truly friendly, nonintimidating error messages and to the wonderful idea of turtle graphics, which has become so strongly identified with Logo as to sometimes be confused with it.

The error messages that you encounter are friendly enough, but some may be found more helpful than others. I quickly spotted my typing mistake when, in testing a procedure to add up a list of numbers, I was told "I don't know how to odd." It took me a bit longer, however, to make any sense out of the "output didn't output to if in add" message I received on my second try.

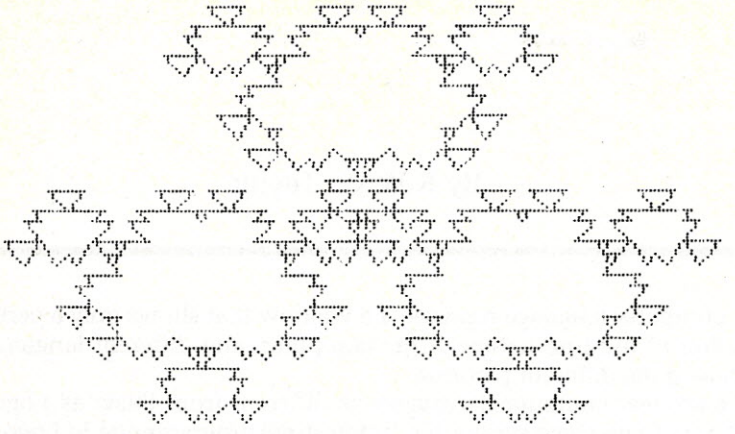


Fig. 1. Intricate designs can easily be created in Logo II.

Turtle graphics are, in some ways, better than ever in Logo II. In addition to all of the standard moving and drawing commands for the turtle, there is a Fill command to allow you to create solid areas of the current pen color. Any pixel on the screen may be scanned by the DotP command or set by the corresponding command Dot. In contrast to the Terrapin approach, there's no distinction between draw and nodraw modes. Any time that a graphics-related command is issued at top level, the screen automatically reverts to a split graphics/text format. Of course, you can always control the screen format, either at top level or from within a procedure, by selective use of the Textscreen, Splitscreen and Fullscreen commands. There are, unfortunately, no sprites. Neither is there any way, as there is in Terrapin Logo, to change the shape of the turtle in order to provide even a limited form of animation.

In The Package...

The Logo II package consists of a double-sided tutorial disk, a program disk, an introductory manual and a hefty reference manual complete with reference card. The material on the tutorial disk, while simple, should easily get most users going. The introductory manual leads you carefully through all the fundamental operations, including the process of formatting slave disks to hold your own procedures and graphics creations.

The reference manual is clear and well-organized and includes several nontrivial examples along with each command covered. Finally, included on the program disk are several sample applications that can be studied to inspire your ideas on sophisticated Logo programming techniques. No matter what your programming background, there should be something to tackle at an appropriate level.

It's clear that some careful decisions about the intended market for this product were made during the development of the system and manuals. Naturally, these decisions won't suit all users equally. For example, once a file has been written to disk, it can't be overwritten with a Save command and must be deleted or renamed before an updated version can be saved. This protects the naive user but quickly gets to be an annoyance for the steady worker.

Another apparent design decision makes it impossible to exit normally from Logo II to the system monitor, and, in general, Apple provides less support for the assembly language programmer than Terrapin does. There are .EXAMINE, .DEPOSIT and .CALL primitives defined, however, so that a knowledgeable programmer can design a convenient assembly-language interface. Above all, there's now room in memory to hold cooperating programs and data.

The Logo II manuals also reflect an orientation toward the computer-shy user, preferring for example to refer to a television set rather than to a monitor. The manuals tend to be a bit unclear, also, about use of peripherals such as disk drives and printers, perhaps on the theory that most of you would be repelled by lengthy technical explanations.

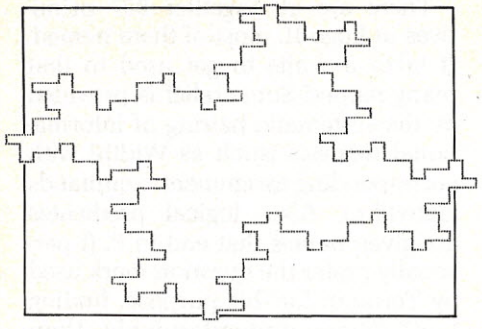
I did finally figure out how to send text to my Epson (a simple process, as it turns out). The manual makes it clear that for the Logo II user, the printer of choice is the Apple Imagewriter, which allows graphics screens to be dumped immediately to paper. No other support for graphics dumps is promised, although it's easy enough later to access stored graphic images from other programs.

Logo II runs under ProDOS, with all the user convenience that implies. The command Online reports the names of currently mounted disks, and Setprefix can be used to gain access to any desired directory without worrying about which disk happens to be sitting in which drive. A start-up file can be established on a disk to autostart an application, and, similarly, a start-up variable defining a list of commands to be automatically executed on loading can be located in any program file. This capability can be used for such purposes as loading custom help screens along with an application.

One of the great strengths of this implementation of Logo is its simple and natural file system—an ingenious Bury command allows specified objects to be temporarily hidden.

Strong Point

One of the great strengths of this implementation of Logo is its simple and natural file system. Program files can be loaded in succession to accumulate the necessary support for complex applications, while an ingenious Bury command allows specified objects to be temporarily hidden when saving to disk or emptying the workspace. These features together encourage a second, higher level of modularity when designing applications in Logo II.



Any procedure or variable in the current workspace may be easily printed out on the screen or placed into the editor for modification. The contents of a disk file may also be easily printed to the screen or (if the file is not too large) placed whole in the edit buffer. Any modifications made to the file are automatically saved back to disk when the editing is terminated.

The disk file being edited could be a program file or a data file. A series of simple commands (Open, Setread and so on) provides for input to and output from up to six data files concurrently (possibly including one device, such as a printer, instead). Alternatively, the command Dribble may be issued, which will simply begin a copy of all screen displays and keyboard entries to a specified file or device. The dribble is turned off, logically enough, by a subsequent Nodribble command. All of these commands may, of course, be issued under program control.

In Logo II, procedures can be defined directly on the current display screen, line by line, without entering the editor. Alternatively, a procedure may be established by applying the command Define to a list of lines that may have been constructed by another procedure. This opens up the possibility of writing procedures to automatically build code to user specification. The companion command Text, which extracts the lines of a specified procedure as a list, can be used to create an automatic documentation application. The lack of essential distinction in Logo between procedures and data is further emphasized by the presence of a Run command, which can be applied to any constructed list of commands, causing it to be executed immediately.

Extensible Language

Logo is an extensible language, which means that you're free to build your own favorite programming environment. It helps that almost any character can be used in forming procedure names. If you get tired of typing CATALOG, just type DEFINE "C [[] [CATALOG]], after which you can get away with typing a simple C whenever you want to see the catalog. Similarly, if you are having trouble visually parsing complicated Logo lines in your procedures—not always a trivial task—you can define an ornamental do-nothing procedure to use as a command separator. For instance, the line

```
CLEARTEXT PRINT SUM RANDOM :N 100
```

can be made a good bit clearer using this idea. You first type DEFINE "| [] and then (with the additional help of a pair of parentheses) improve the line into

```
CLEARTEXT | PRINT SUM (RANDOM :N)
100.
```

The Sum command in the preceding example is a *prefix* form of the standard *infix* command +. Another way to write the line would be CLEARTEXT | PRINT (RANDOM :N)+100. Each of the standard arithmetic and logical infix primitives built into Logo is accompanied by a corresponding prefix primitive with, for example, = matched to EqualP. Primitives that don't have a standard ASCII symbol for infix use (such as logical "and") are provided *only* in prefix form (AND). The advantage a prefix primitive enjoys is that it can accept a variable number of arguments. Thus, though it looks a bit strange, the sequence (AND :YEAR="1984: MONTH ="AUGUST :TEMP > 80) is a valid test in Logo II.

Most extended computations in Logo are best achieved by recursion; even though labels and gotos are possible, they are seldom needed. It's this fact that gives ingrained Basic programmers the most trouble when they first try to use Logo. It isn't until a number of elegant recursive solutions to standard programming problems has been observed and digested that the impulse to branch can be easily resisted.

Numerous control structures are actually available to the Logo II programmer, including some that you build for yourself. An if...then... else construction is available through a command such as IF :X=0 [MAKE "GAME "HOME] [MAKE "GAME "AWAY]. A clearer and more flexible way to achieve the same result is to test the condition and check the resulting match state:

```
TEST :X=0
IFTRUE MAKE "GAME "HOME
IFFALSE MAKE "GAME "AWAY
```

Multiple consequences of a match can be called for in this way, embedded conditional tests can be set up and so forth, up to the limit of your ingenuity. As one example of the possibilities, a while procedure is included as a useful tool on the program disk.

One particularly clever idea built into Logo II is the pair of commands Throw and Catch that greatly generalize the Onerr Goto feature of Applesoft Basic. Also, the primitives Count and Item are fast enough to allow practical indexing of lists. A final comment on programming in Logo II should mention the Localize command, useful for preventing temporary variables within a subprocedure from poisoning the higher-level working environment.

No Head for Math

Even with its rich set of control structures, Logo II is not suited for mathematical applications. The tutorial disk rather coyly skirts this point, suggesting that the average user won't be interested in such advanced mathematical concepts as the square root. While there is, in fact, an SQRT primitive in Logo II, no other roots or exponentials are available except through a long chain of defined procedures (provided in a USEFUL .TOOLS file) that ultimately rest on the calculation of the natural logarithm of a number by a series expan-

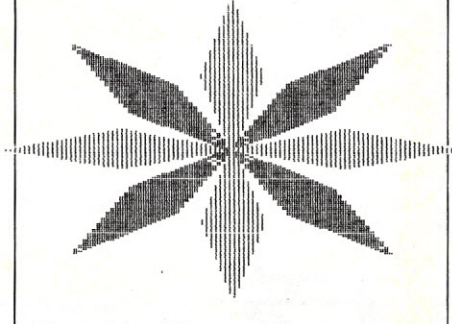


Fig. 2. A fast fill routine allows areas to be colored in by the turtle.

	Terrapin Logo 1.3	Apple Logo II
Operating environment	Apple II, II Plus	Apple IIe, IIc
Memory requirement	64KB	128KB
Number of primitives	118	207
Size of clear workspace	2287 nodes (11KB)	7190 nodes (35KB)
Size of edit buffer (in characters)	8192	6144
Maximum program line (in characters)	256	125
Time required to sort 45 numbers by recursion (in seconds)	40	30

Table 1. Comparison of Logo implementations.

sion. Numerous other standard mathematical functions, including a few common trig functions, are left as an exercise. Real numbers are referred to in the reference manual as decimals, and no attention is paid to the inherent limits of precision in floating-point representation, even though it's easy to generate anomalous results using the built-in numeric formatting primitive Form.

On the positive side, a defect in earlier Logo implementations has been fixed, allowing more convenient use of the minus sign to represent negative numbers. However, attempts to use a minus sign as a literal within a word (perhaps as a hyphen) may be misconstrued by Logo. This parsing problem also exists with respect to several other characters identified as delimiters, and the clumsy device of prefixing such characters with a blackslash must be employed. Thus, PRINT 5+9 yields 14 (as you would expect), but so does PRINT "5+9. If you want the display 5+9 to appear, you must type PRINT "5\+9.

There are all together 207 primitives in Logo II, most of them named. It takes a while to get used to that many names! Some relief is provided by the systematic pairing of informational requests (such as Width) with corresponding assignment commands (Setwidth). Also, logical predicates are given names that end in P. (I personally prefer the question mark used by Terrapin for this purpose, finding List? more understandable than ListP). The naming system is muddied a bit by the two-letter abbreviations established for common Logo commands—only rote memorization, it seems, will deal with the fact that Se means Sentence, while Ss means Splitscreen and St stands for Showturtle.

One final point that needs attention is the speed of loading Logo II applications from disk. Even a modest-sized application such as the USEFUL.TOOLS file on the program disk takes 40 seconds to load from a standard drive, and some of the demonstrations provided on this disk require well over two minutes! You are likely to find these times are simply not acceptable. This will limit the value of the language as a medium for end-user applications unless a way around this problem is found.

This may be a false issue, in that the development of end-user applications is perhaps in itself not an appropriate goal for Logo, and all of the fun is in getting there. Certainly there's a great deal of enjoyment and education to be gained from playing around with Logo II on the Apple. One measure of its impact will be the number of articles appearing in computer magazines in the future, documenting further creative applications of Logo and showing how to extend its capabilities. I'm prepared to bet that you'll see those articles!■

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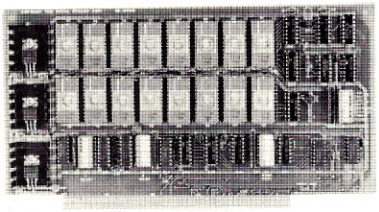

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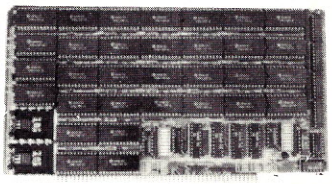

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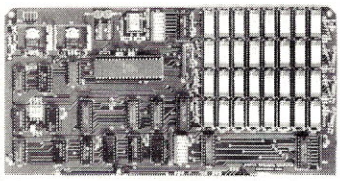

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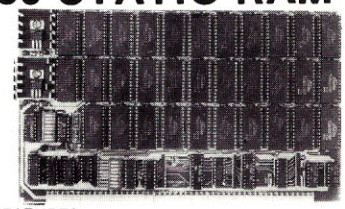

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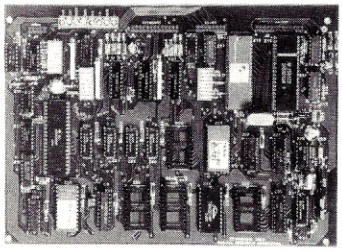

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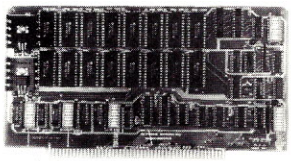

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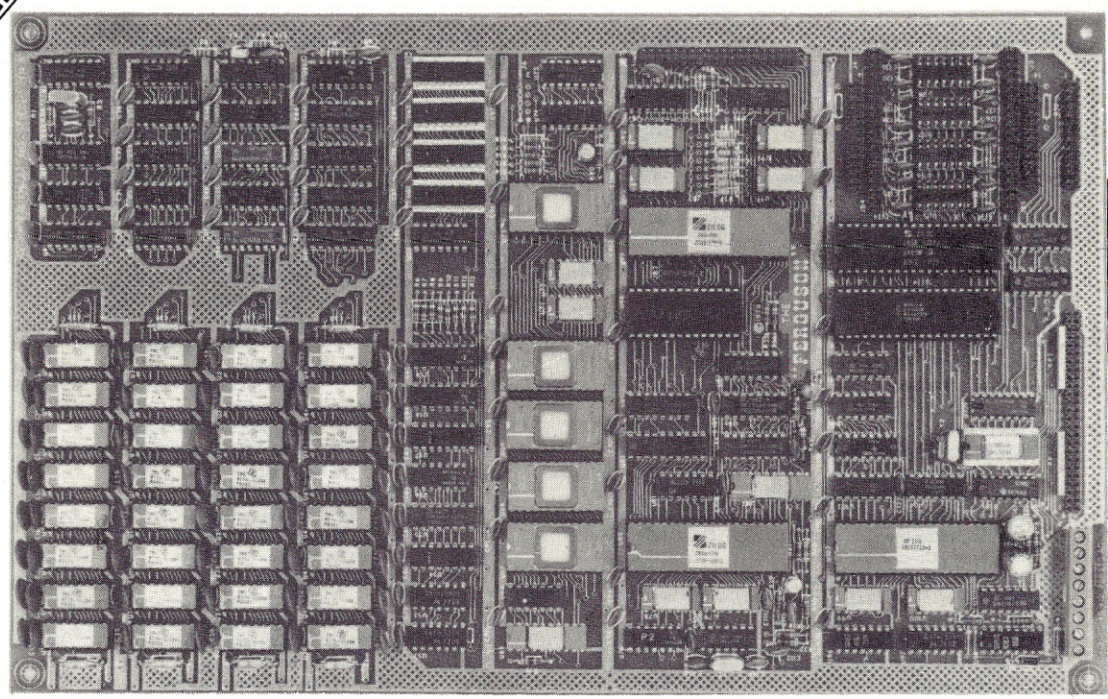

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Super List Manager—Keeper of the Records

System Requirements: Any MS DOS machine; 128KB; two disk drives; printer.
Manufacturer: Pinnacle Software Systems Inc., Box 1220, Fort Collins, CO 80522.
Price: $249.

Super List Manager is a dedicated record keeper, mailing list manager and report and document generator. It was originally written for the Victor 9000 and is currently available for MS DOS systems.

The version I'm reviewing is 3.20, which requires two disk drives and an unspecified amount of RAM (I'm working with an IBM PC with 256KB and it worked well). I've been using this product for the last three months, managing the very small mailing list of a newsletter with which I'm associated.

Jump Right In

One interesting aspect of Super List is its tutorial approach. The 7½ × 9½-inch three-ring simulated leather manual is a tutorial that Pinnacle Software recommends you read before attempting any data manipulation. Sample files on the disk correspond to those described in the manual. This approach is especially helpful if you have a certain amount of computerphobia. Old hands will master the program faster. I really didn't look at the on-disk data but jumped right into using the program.

Another nice feature is never having to look at a blank screen while any operation is in process. For example, when printing out mailing labels, the program lets you know that something is going on.

For the most part, the program is easy to use because it's totally menu-driven. All choices are presented in menu fashion—you just have to remember to type START at the A> prompt. Once you've read the manual, played with the data a bit and started putting in your own data, you can put the documentation on the shelf. You'll probably never have to look at it again, except to look up little-used commands.

A Quartet

Super List Manager breaks down into four areas: master data file, report generator, document generator and system reporter.

The master file is the heart of the program. It's divided into 16 fields—name, address, memo, date and so on—with the sixteenth divided into eight subfields. Fields have been set up with predefined names and sizes, neither of which can be changed by the user.

According to Super List Manager's author, Paul Enockson, field name and field size were fixed so that the program would be less complicated. I'll buy that—the program *is* easy to use. But I still wish I could change those field names to match my previous record keeping.

A noteworthy feature of the file system is called Query, a free-form display. You can take the information in any one, two or three fields—there is a limit—and list it in a specific way. If I want to know which subscribers will be renewing soon, I can have the program list field I (name) and field II (identity, in this case the last issue in a subscription). Using the selection option, I can list those readers whose subscriptions end with issue 15—a really nice little time-saver.

Compose (a report design tool) and the document/letter functions are straightforward. Compose allows you to create reports from the data in the Super List Master file. The document/letter functions allow you to generate, among other things, personalized letters pulling names and addresses from the Super List master file. I use this last function to send letters to those readers who haven't renewed their subscriptions.

The system report function allows you to generate your master list (all file information), a phone directory and address directory or to print postcards and labels from the master file.

This is the only portion of the program where I had any problem. While I had no trouble generating mailing labels, I did have problems printing out the master list. I was able to print the list out on my IBM graphics printer, but the page breaks fell nowhere near the paper perforations. In fact, the page breaks fell in different places on standard 8½ × 11-inch paper. I brought this to the attention of Mr. Enockson, who assured me that I seem to be the only person with this problem. I'm sending further information to him so we can discover what the problem is.

Qualms and Quibbles

I really like this product because it does what I want it to do, but I *do* have a few qualms about the documentation. As mentioned earlier, the manual is presented as a tutorial. Each section is separated by tabs, with an extensive appendix section of error messages and sample reports.

As a tutorial, it's great, but it doesn't go far enough. According to the author, it was written for those who know very little about computers. Once you're familiar with the program and need the manual strictly for reference, it's a drag to search through all that cute prose.

That's a small quibble. A bigger quibble is that some sections assume too much. For instance, the section on allocation in the back of

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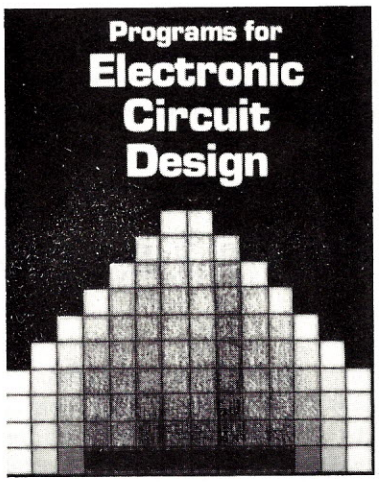

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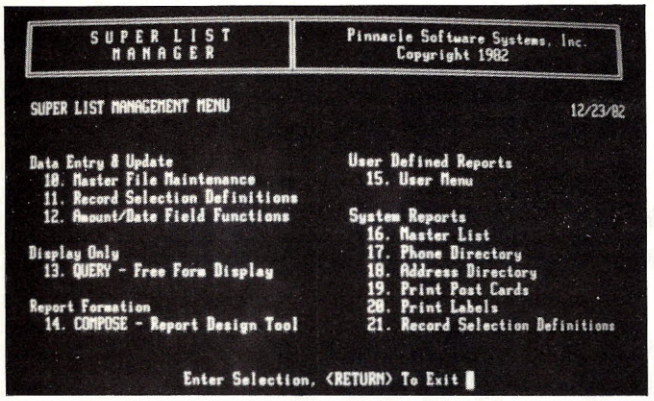
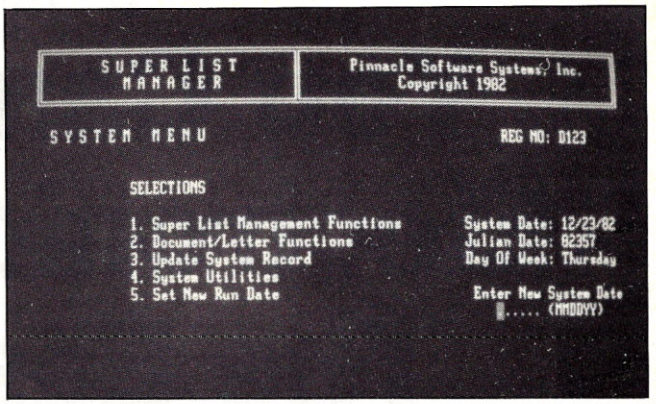


The main menu from Pinnacle Software's Super List Manager.



Super List Manager's system menu.

the manual never makes it clear that you need two disks, although two disks *are* mentioned in the initialization section in the beginning of the documentation.

I kept trying and failing to allocate my files on my main disk. I finally figured out that two disks were needed. But that conclusion was strictly my own assumption—nothing in that section either confirms or denies it.

One last comment on documentation: it's one thing to tailor the manual to the novice and another to leave out basic information. Omission of such basic information as the minimum RAM requirements and the need for having two disk drives almost render an otherwise fine product useless.

If you're looking for a dedicated mailing list manager, document, letter and report generator, give Super List Manager some serious consideration. I don't think you'll be disappointed with its performance.

Allyson Dyar
Dafydd Dyar
Omaha, NE

Fun—New Entry in the Language Sweepstakes

System Requirements: IBM PC or PCjr; 128KB; one disk drive.
Manufacturer: Levien Instrument Co., Box 31, McDowell, VA 24458.
Price: $149.95.

Bored with Basic? Perplexed by Pascal? Leery of Logo? Perhaps you'll be interested in Fun, a new programming language for the IBM PC.

Fun, in spite of its name, is a language designed to teach good programming habits like structured code, modularized procedures and functions. Fun is an interesting alternative to the other PC languages on the market. Let's look at the various components of Fun to see how it measures up.

Control Structures

Fun has two basic control structures—loop . . . endL and if . . . then . . . else. The Begin and End statements, as in Pascal, cause multiple statements contained within a begin . . . end block to be treated syntactically as though they were a single statement. This allows multiple statements to be used in an else clause, for example. The Break statement is used to exit from the current block. Break may be used in combination with if . . . then . . . else to simulate other control structures, such as while . . . wend. As it should be in a structured language, there is no Goto statement.

There are other features that contribute to efficient design of modular programs, including the ability to use local variables and the ability to create commands that will accept a variable number of arguments. (I use the term "command" interchangeably to refer to either a procedure or a function. A function returns a value; a procedure doesn't.) The function ARGC returns an argument count, which may then be used to establish defaults for whatever arguments aren't supplied by the user. For example, the defaults for the procedure ARC, which takes up to six arguments, will cause a perfect circle to be drawn if the final three arguments are omitted.

Help

Debugging and programming aids are definitely Fun's biggest strength. Every effort is made to make the programmer's job as simple as possible and to provide helpful diagnostic information when a procedure won't execute properly. Fun, like Basic, is an interactive language. Procedures may readily be tested at the keyboard without going through the usual edit/compile/run process. Any new procedure may be edited with the Edit command. This edit mode allows full-screen editing. The ability to edit procedures that aren't created with the editor is found in very few other programming languages.

Loops are automatically indented as you type them in, and

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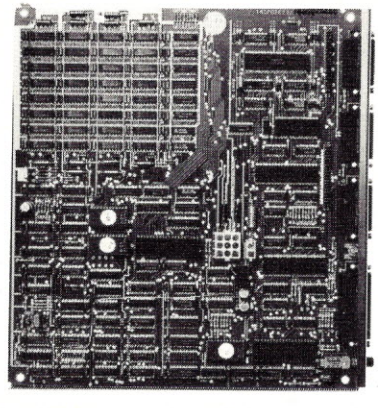

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the system prompt changes when you're within a procedure definition. Fun has a Trace command that displays not only each line as it executes but the value of each variable as it changes.

If an error occurs, Fun displays the offending line, highlights the portion of the line that seems to have caused the error and displays an informative error message. The name of the offending procedure is also displayed. These features combine to make Fun as easy a language to debug as any.

Power Particulars

Fun supports both integer and floating-point math, including a wide variety of mathematical functions. The exponentiation function ^ is supported, as well as EXP (e to the x power), natural and base ten logarithms, square roots, absolute value and trigonometric functions. Commands exist to return the ASCII value of a character and to truncate a number to integer format. In addition to normal division, truncated integer division and a remainder function are also available. These functions are comparable to those in most other high-level languages.

Fun's main drawback is its limited data handling ability. There are only 26 variables available (A–Z), numeric only. In-memory arrays of up to 1KB are allowed. These arrays may be used to store either character or numeric data. If numeric data is selected, an array may have up to 128 entries.

There is, however, no way to access larger amounts of data or to read and write data files to disk. The Save command, which writes the currently defined procedures to disk, is an all-or-nothing proposition—there is no way to save a data array independently. In addition, you can't access memory locations directly or interface assembly language modules (Peek, Poke, Call and so on). Clearly, this language is unsuitable for all but the most trivial business programming.

For Fun's intended audience, however, these shouldn't be significant drawbacks, although the ability to read and write even simple, small data files would be a major plus. In addition, you can't take advantage of the many special keys on the IBM keyboard; the single key input command, Key, will only return a meaningful value for ASCII characters.

Speed Scene

If you really care about speed, buy something else. This is a very slow language. The results of benchmark tests show Fun is several times slower than even interpreted Basic. Since this language is incapable of handling large amounts of data, however, slowness is usually not a problem. The only area where Fun's lack of speed has a significant effect is when you're drawing graphics. If you're interested in high-speed animated graphics, a language such as Gra-Forth (a high-speed Forth variant for the PC/Apple) would be a better choice.

Graphics and Sound

Fun supports both graphics and sound. The Sound command takes frequency and duration as inputs. The manual contains a table of values for various notes and note lengths. The Sound command did not function properly on a PC XT, although it worked as specified on both a PC and a Compaq.

There are a number of graphics commands. Mode switches between the various graphics and text modes available. Plot plots a point or a series of connected points, drawing lines from one point to the next as needed. Arc creates an arc of any size, eccentricity or shape, including ovals and circles. Color sets colors for foreground, background and highlighting.

Dump dumps a graphics screen to an Epson printer. The size of the image produced is 5⅓ × 2⅞. Paint fills in an enclosed area with color. On the samples disk, there is a turtle graphics microworld that contains the commands InitTurt, DrawTurt) actually draws an

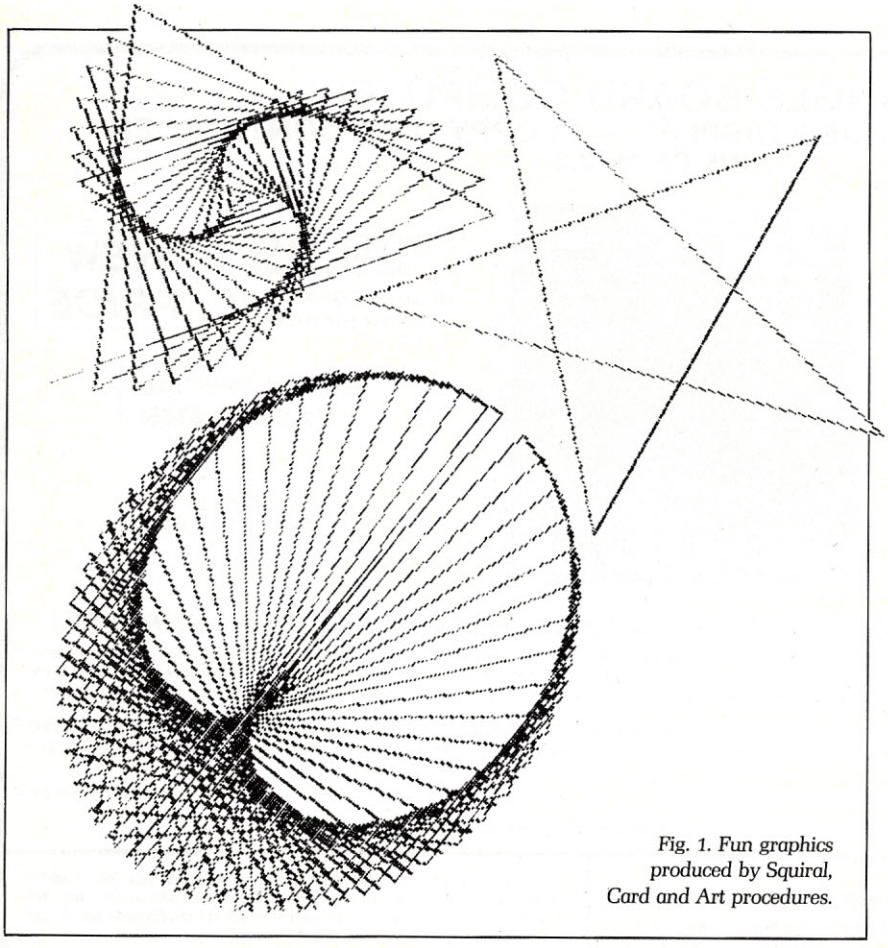

Fig. 1. Fun graphics produced by Squiral, Card and Art procedures.

arrow), FD (forward), LF (left), BK (backwards), RT (right), DrawLF, and DrawFD.

This isn't as complete a set of turtle graphics words as is usually supplied (it lacks Penup and Pendown among others) but is sufficient to get the flavor of turtle graphics. Since the language is extensible, the set of turtle graphics words is limited only by your imagination and programming ability. A more annoying problem is the fact that Fun redraws the turtle after each move. To remedy this, merely remove the DrawTurt statements from the offending procedures or create your own EraseTurt procedure.

Fig. 1 shows samples of the graphics Fun can produce.

Do It Yourself

Fun is designed to easily let you create your own procedures and/or functions, giving your own names to them. For example, you can create a procedure, called Amber, that turns the screen amber:

```
PROC AMBER
CLS 6
ENDP
```

From this point on, you only have to type the word AMBER to change the screen's color. In contrast, in a nonextensible language, such as Basic, you have to look up the proper color number for the Screen statement every time you wish to turn the screen amber. As you program in an extensible language, you can make the language more powerful and easier to use. It's difficult to then go back to Basic, Fortran, Cobol or whatever.

The Words

Fun's current documentation is inadequate. It consists of a number of small booklets that were printed using dot-matrix print of various qualities. The booklet with the best quality print is lacking page numbers. Illustrations are either hand drawn or screen dumps of the graphics produced by Fun.

The review copy has a very low serial number, and I feel it's fair to assume that the documentation is preliminary. Among the many missing items are an index and a memory map. Even worse, for a beginner's language, is the fact that several of the programming examples in the manual are incorrect.

The Multab procedure, which is supposed to produce a multiplication table, has two mistakes. The first, an omitted carriage return, causes the results to print out sequentially rather than in table format. The second, which will cause problems for a beginner, is an extra inserted space. This not only causes the procedure to bomb but causes an incorrect error message ("You need quotes here").

The Card procedure as written in the manual produces a single point rather than the intended shape. The error is in a fairly complex formula, and a beginner probably wouldn't realize why the example didn't work.

In addition, there is at least one error message in Fun, "You misspelled a delimeter [sic]," which is not documented in the manual and which appears at times when it doesn't seem to be appropriate. The word delimiter is spelled incorrectly, particularly unfortunate for an error message concerning spelling. A program in this price range should have far better documentation.

In Summary

What makes Fun preferable as a beginner's language? Fun is intended to be a stepping stone to languages like Pascal and C in the same manner as Logo may be seen as a stepping stone to Lisp. Although Fun doesn't have the power of C or Pascal, it actually has some advantages.

Most significantly, Fun is interactive and, therefore, more suited to the beginner than the more powerful Pascal. You can write meaningful code within minutes of starting to learn Fun. There is no editor or compiler to contend with. Although Basic is interactive, Fun is superior because of its structured nature and because you can assign meaningful names to procedures.

The error messages in Fun are extremely useful to beginners or to anyone, for that matter. The cursor is positioned over the exact portion of the command causing an error, and an appropriate message is displayed.

Logo and Fun are similar—slow, user-friendly, structured and interactive. Fun is more compact, however. Forth is compact and interactive as well as fast and powerful, but its reverse Polish syntax makes it less straightforward.

While it isn't a perfect language, Fun is a contender in the entry-level language sweepstakes, except for the documentation. A language intended for beginning programmers simply must have documentation suitable for beginners. Even with greatly improved documentation, Fun will still be competing with Logo, Pascal and other languages established in the educational market.

Bob DeGrande
New York, NY

Micro Link II—Hook Up

System Requirements: TRS-80 Model 4; 64KB; one disk drive; TRS DOS 6.x or DOS Plus IV.
Manufacturer: Bi-Tech Enterprises Inc., 10 Carlough Road, Bohemia, NY 11716.
Price: $49.95.

Finally, after a year and a half on the shelves at Radio Shack Computer Centers, the TRS-80 Model 4 is starting to get its fair share of software. And this terminal package from Bi-Tech Enterprises is a good one that makes the best use of all the features you want to see in telecommunications software.

Getting started with a new piece of software is tough when the documentation is sketchy, but this isn't the case with Micro Link II. Instructions for setting up a dedi-

cated disk for telecommunications are complete and easy to follow. The manual describes everything that's going on during the set-up procedure, even though much of it is transparent to the user. When the initialization is complete, you feel like nothing has been left out in setting up your custom-made terminal package. Whether you use DOS Plus IV or TRS DOS 6.x, set-up instructions are fully explained.

There is, however, one thing in the initialization procedure that is not explained in the manual. TRS DOS 6.x takes an enormous amount of room on a system disk, which leaves very little room for other information. A Do file transfers 11 Micro Link II files to a system disk during the set-up procedure, but there isn't enough room for all of them on an unstripped 6.x system disk. Bi-Tech would have done better if it included some information on clearing extra system files from the system disk instead of letting you fend for yourself.

Bi-Tech provides a superior product for the Model 4 that is worth the investment for both beginners and old pros.

Micro Linking

When you run Micro Link II, the RS-232C is initialized at 300 bits per second, seven bit words, even parity and one stop bit. You can change the parameters and store them using the F1, F2 and F3 function keys on the Model 4. In fact, the program makes excellent use of both the function keys and user-definable functions for number keys 1 through 8.

Micro Link II uses the clear key on the Model 4 as the control key. Pressing the clear key in conjunction with a variety of other single keys allows you to perform all the functions needed in a powerful telecommunications package. Press CLR-H to display the help menu, which shows all the command functions and their corresponding keys. In addition to command functions, the help menu lets you examine the modem parameters and control the program's 40KB buffer.

If you're familiar with other telecommunications programs, you'll recognize many of the terminal functions, such as an echo on/off switch, a linefeed switch and a printer toggle. Micro Link II also provides unique features to Model 4 telcom programs by allowing you to control the type of protocol used (Christensen or XON/XOFF), load binary files as ASCII and transmit your log-on message when you call a host computer.

Micro Link II supports two especially handy telecommunications features: You can press the CLR-spacebar combination to see your disk catalog, and the CLR-0 combination lets you assign often-used string information to keys 1 through 8.

Readability

I had mixed feelings about the quality of this product when I first looked at the package and documentation. Micro Link II comes in a red vinyl three-ring binder—much too large for the 20-page instructions inside. Perhaps Bi-Tech doesn't want it to get lost among the other program binders on your software shelf.

The data disk containing the programs that comprise Micro Link II is a yellow-jacketed floppy instead of the boring black that plagues the software industry. The yellow makes a nice change of pace.

As far as the documentation goes for Micro Link II, I like it. The format is clear, to the point and in the proper order you need to follow in using the program. The material used for the manual is a heavy, coated paper that will certainly stand the test of time and abuse from users with poor storage facilities. Regrettably, some of the print bled during the coating process, making the words difficult to read. That factor gives the documentation a rather cheap appearance in places.

Logging Off

Before Micro Link II, many Model 4 owners had to use Model III terminal programs that don't take advantage of the Model 4's additional features. Micro Link II uses the function keys and alternate keys that were formerly unused with Model III programs. The 40KB buffer makes uploading and downloading large files easy, and the format of the help menu makes the program a pleasure to use.

Although the documentation has some cosmetic flaws, it's easy to use and follow to get the most out of the program. In my opinion, Bi-Tech provides a superior product for Model 4 telecommunications that is worth the investment for beginners or old pros in telecommunications.

Bradford N. Dixon
Peterborough, NH

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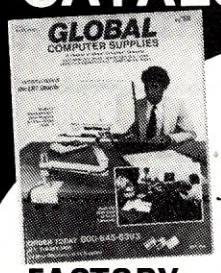

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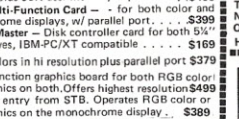

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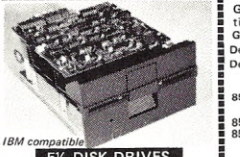

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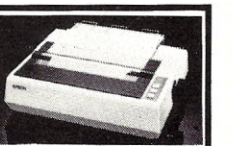

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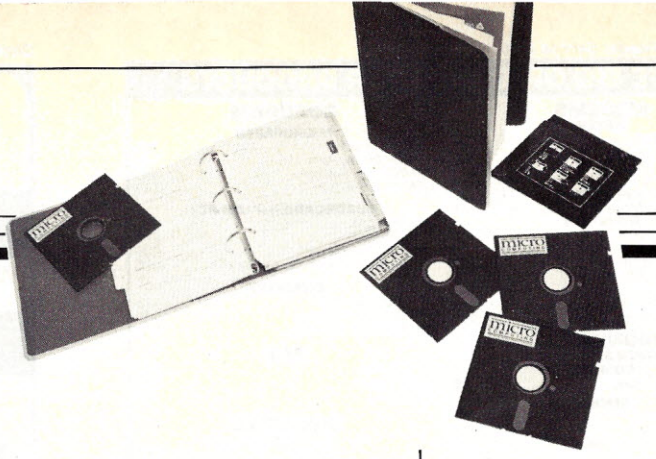
Edited by Amy Campbell



Add Clout to Your R:base Software

R:base Clout ($195) gives your Microrim series of relational database management software an artificial intelligence natural language interface. It lets you simultaneously search five different files from the 40 concurrently available files in R:base. Clout's built-in 200-word dictionary, with room to define additional words, lets you query the database with your own terminology.

On installation, Clout reads the attributes in an existing database and adds them to the dictionary. It then lets you build the dictionary with synonyms for words or operations associated with that database.

You interact with Clout by typing in a word or series of words not already in the database vocabulary. It responds with questions to direct you in defining unfamiliar terms. For example, you can access a field of data-entitled jobs by constructing definitions for the words "occupation" and "work."

You can search a database to retrieve records based on adjectives or qualifying terms, but, more importantly, you can define words that are the result of computation or data manipulation (profits).

Clout operates on PC DOS, MS DOS, CTOS, BTOS and Unix systems with R:base 2000, 4000 and 6000 and the Extended Report Writer software. Microrim Inc. is headquartered at 1750 112th Ave. N.E., Bellevue, WA 98004. Reader Service number 401.

Friendly IBM PC And Junior Processor

FriendlyWriter with FriendlySpeller ($89) is an easy-to-get-to-know full-function word processor designed for business or personal letters up to six pages in length. It includes a 70,000-word dictionary, a user-created dictionary, single keystroke commands, on-line help and support for more than 50 printers.

You can define the letter format for five by seven-inch, 8½ by 11-inch and 8½ by 14-inch paper. You can name documents with titles up to 25 characters in length and create an additional identifying phrase to appear in the directory (for instance the first line of the letter).

The software runs on the IBM PC and compatibles and is PCjr compatible (with 80-column monitor). The two-disk package requires PC DOS with 64KB RAM for DOS 1.0 and 1.1 or 128KB RAM for DOS 2.0, 2.11.1, 2.0 and 2.1. FriendlyWriter is available from FriendlySoft Inc., 3638 W. Pioneer Pkwy., Arlington, TX 76013. Reader Service number 402.

MicroGantt: Project Scheduling Aid

MicroGantt ($395), a general-purpose project scheduling program, helps you create project plans quickly and interactively. Designed to handle managerial-type situations, the program uses critical path techniques to determine task relationships, slack time and project completion dates.

You create the project by defining a typical work week and choosing a time scale and starting date. You can interactively define various tasks, such as work and time requirements, worker dedication and billing rates. The program calculates the program schedule and budget, eliminating estimating and guesswork.

Bar charts display the project timetable at a single keystroke. Other keystrokes scroll the display through time to let you examine worker time allocations, time and material outlays, and task dependencies. You can also create projects within projects.

Project files are convertible to text files (and vice versa) that you can input to sort utilities, spreadsheets and word processors. MicroGantt requires an MS DOS or PC DOS computer with 128KB RAM, or a CP/M-80 computer with 64KB RAM and is available from Earth Data Systems, PO Box 13168, Richmond, VA 23225. Reader Service number 405.

```
Current Query Context
list the salespeople with salary greater than average
which of those are in california
are there any poor performers

Did not understand: poor performers
Please enter a synonym or change spelling.
R>salespeople with sales less than plan

Do you want to make this a permanent definition? (Y/N).....
```

Clout's artificial intelligence interface lets you query your R:base database in conversational style.

Mighty Mail for MS DOS Machines

Mighty Mail is a series of telecommunications interaction programs for the IBM PC and compatibles that fully automates electronic mail and information systems at the touch of a single key. The series consists of six separate packages that let you access ITT Dialcom, MCI Mail, The Source, Western Union's EasyLink, Newsnet, Dow Jones and Dialog's Knowledge Index without having any knowledge of their specific technical features.

Mighty Mail acts as the automatic pilot and responds intelligently to the command structure of the system it's accessing. The program reduces your access time through automation and lowers your connect time charges. It can send and collect files created by other software unattended, or you can program it to deliver and collect electronic mail at after-hour times and to date stamp incoming mail. Other features include sophisticated mail sorting, file management and password protection.

Mighty Mail/ITT Dialcom is priced at $349. Add-ons for other services are priced separately and available through New Era Technologies Inc., 2025 Eye St. NW,

Suite 924, Washington, DC 20006. Reader Service number 406.

DOSsed or Confused? Meet Survival Kit

The Survival Kit ($39.95) is an on-line reference guide for PC DOS and MS DOS that can help you make your way through the operating system safari. It gives you help on how to use DOS commands, explains error messages and how to correct errors, and gives directions for setting color on a color monitor as well as setting blinking cursors, underscore and boldface modes.

Written for both the novice and experienced user, Survival Kit frees you from consulting your DOS manual. When a problem arises, go back to prompt and type the section of the program from which you want help (PC/Message, PC/Help or PC/Color). The self-documented program can be installed on a hard disk or RAM drive.

Survival Kit is also available in French, Spanish and German versions from Relational Solutions Inc., 8723 Woodleigh Drive, Houston, TX 77083. Reader Service number 403.

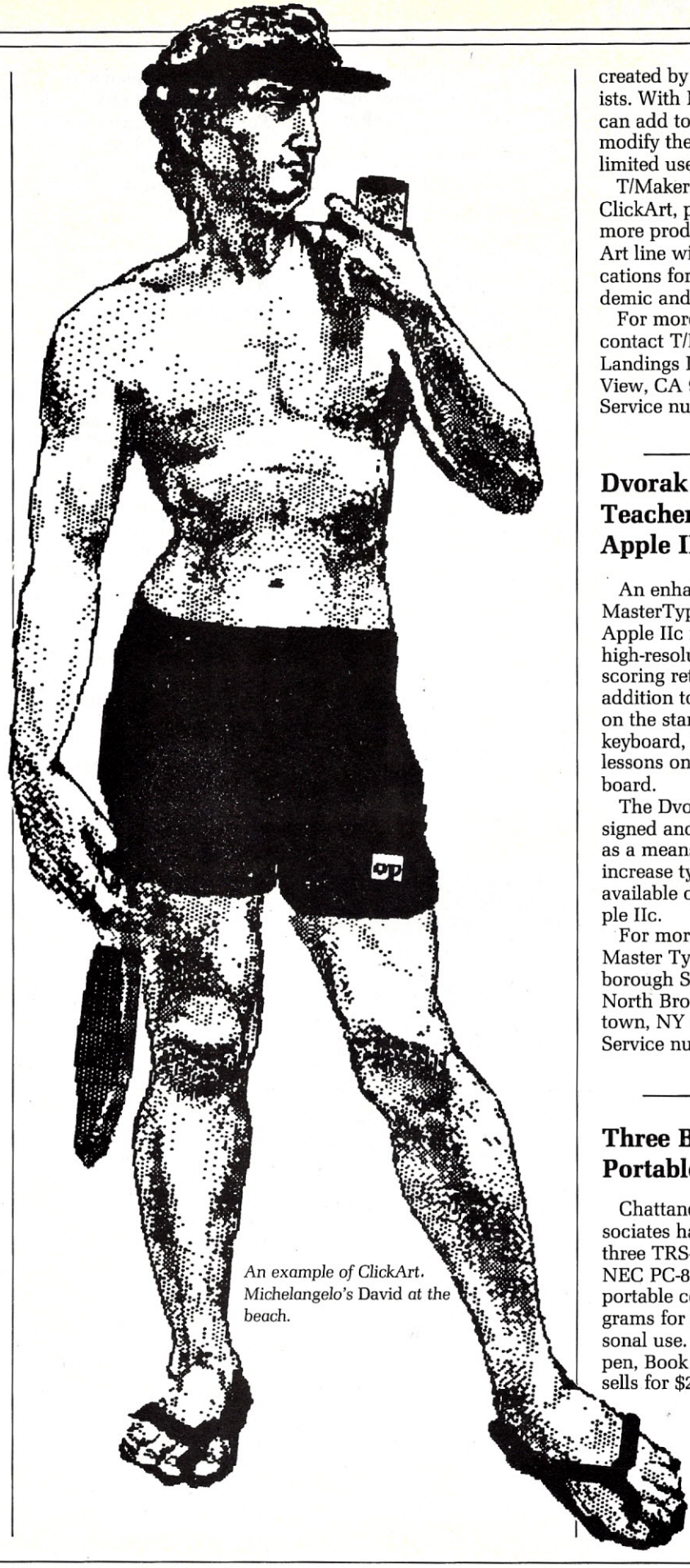
ClickArt For Macintosh

Spice up a memo, create an invitation or print out your own Imagewriter pinup of Albert Einstein, Michelangelo's *David* or Boy George with ClickArt ($49.95), a collection of images for use with the Macintosh MacPaint program.

The collection includes symbols for use in charts, such as arrows, stars and borders; drawings to add to announcements, such as wine glasses and bottles, city skylines and cartoons; and full-screen drawings created by professional artists. With MacPaint you can add to, delete from and modify the images for unlimited uses.

T/Maker, producers of ClickArt, plan to release more products in the ClickArt line with specific applications for business, academic and design use.

For more information, contact T/Maker Co., 2115 Landings Drive, Mountain View, CA 94043. Reader Service number 410.



An example of ClickArt. Michelangelo's David *at the beach.*

Dvorak Keyboard Teacher for Apple IIc

An enhanced version of MasterType ($49.95) for the Apple IIc now includes high-resolution graphics, scoring retention and, in addition to the 18 lessons on the standard Qwerty keyboard, it includes five lessons on the Dvorak keyboard.

The Dvorak keyboard, designed and patented in 1936 as a means to dramatically increase typing speed, is an available option on the Apple IIc.

For more information on Master Type, contact Scarborough Systems Inc., 25 North Broadway, Tarrytown, NY 10591. Reader Service number 413.

Three Briefcase Portable Programs

Chattanooga Systems Associates has announced three TRS-80 Model 100 or NEC PC-8201A briefcase portable computer programs for business or personal use. They are Autopen, Book and Trip. Each sells for $29.50.

Autopen utilizes the machine's text program to provide a powerful word processor in 2.5KB of RAM. You can use it without commands for simple word processing, but with a few commands, you can change format parameters and control printer features. With Autopen you can transform your computer into a full-featured buffered typewriter.

Book is a single-entry bookkeeping system for small businesses. Its system of 52 accounts is based on reporting requirements of Federal Income Tax Form 1040, Schedule C, with the travel and entertainment account expanded to record details for meals, lodging, transportation and so on. It requires approximately 3.8KB of RAM.

Use Trip to keep detailed expense account records and notes on business or recreational trips. It is suitable for appointments, reminders and trip reports. It requires about 2KB of RAM.

For more information, contact Chattanooga Systems Associates, PO Box 22261, Chattanooga, TN 37422. Reader Service number 415.

Integrated Spreadsheet For the Apple

PractiCalc II ($69.95) is an integrated, full-featured spreadsheet program with word processing and database capabilities for the Apple IIe, II Plus and Apple-compatible computers from Practicorp International.

It offers more than 15 spreadsheet features, including the ability to sort and search alphabetically and numerically, integrate spreadsheets with word processing, create fixed titles of rows and columns, create graphic displays of results and use popular printout interfaces.

Practicorp claims its software runs four times the speed of Multiplan and twice the speed of VisiCalc. For more information, contact The Silk Mill, 44 Oak St., Newton Upper Falls, MA 02164. Reader Service number 414.

PractiCalc II for the Apple II Plus and IIe integrates spreadsheet capacity with word processing and database management for only $69.95.

Micro Products Adds Software

American Micro Products has added three programs to its software line for the TRS-80 Model 100 and compatibles: Journalist, File Manager and Assembler ($99.95 each).

With Journalist you can format a text file and output it to a printer or to another RAM file. Its features include WordStar compatibility, left/right justification, margin changes, page pausing, printer controls, multiple copy capability, variable line spacing and a plot function.

File Manager lets you set up a data file and organize, use and retrieve that data according to your needs. It requires 24KB of RAM and includes these functions: format, add, load, save, status, modify, move, find, report, summary, sort and exit.

Assembler does what you would expect it to do. It assembles 8085 assembly language and produces machine code for the computer. The program uses 12KB of RAM and requires a 24KB machine.

For more information, contact American Micro Products Inc., 705 N. Bowser, Richardson, TX 75081. Reader Service number 416.

Brainstorming With Your Micro

With the Knowledge and Mind Amplification System ($147), you and your computer can brainstorm together and try to make sense or bring order to your scattered ideas and thoughts. Called Kamas for short, the software is an integrated program that combines an outline processing mode and information retrieval as a core, with word processing, telecommunications and optional programming facilities.

Outline processing lets you deal with the structure of your ideas independently from the textual content. You can arrange your ideas in a dynamic, hierarchical outline, filling them out with text as needed. You can then insert, delete and move items.

Information retrieval lets you access your thoughts and see how they fit together. If you can't remember the exact key or spelling, you can search for a sound-alike key or search for any string in the detailed text using a rapid partial-match retrieval technique.

You can display the local neighborhood of ideas or focus back through the tree-like structure to view the ancestry of a specific idea.

Word processing and telecommunications facilities let you deal with the structure and format of your text, produce hard copy and set up an electronic bulletin board system to allow remote access of Kamas. Available for Z80 computers with 56KB of RAM and two disk drives, Kamas runs on CP/M version 2.2.

For more information, contact Compusophic Systems, 2525 S.W. 224th Ave., Aloha, OR 97006. Reader Service number 417.

Beethoven Rolls Over

Beethoven would roll over in his grave if he knew how easy composing, editing and printing scores is with an Apple Macintosh and the Professional Composer software.

An interactive music notation editor, Professional Composer ($495) lets musicians edit scores on a Macintosh

(via mouse) as they compose and arrange original music. It functions much like a word processor except that you enter notes instead of characters.

It edits in standard musical notation for all arrangements. Music text appears on the screen as it would on a piece of sheet music, including notes, rests, accidentals, beams, chords, ties, n-tuplets, time signatures, clefs, measure lines and note embellishments.

In addition, the program can show you the underlying structure of the music by displaying scores voice by voice (each instrument) or multiple voices all on one staff. It can transpose an entire score to a different key, check timing on each measure and detect errors.

Professional Composer is a product of Mark of the Unicorn Inc., 222 Third St., Cambridge, MA 02142. Reader Service number 411.

dBase II Grows Up: Here's dBase III

Ashton-Tate promises that dBase III ($695), its newest relational database managment system, will do for 16-bit and larger microcomputers what dBase II did for eight-bit machines.

More powerful and faster than any other microcomputer database on the market, dBase III is not an extention of dBase II but a new program written in C language (which makes it portable and fast). It is compatible with dBase II as well as Ashton-Tate's Framework. A conversion utility lets you use dBase III with your old dBase II files.

Like its predecessor, dBase III uses the dBase programming language and the same English-like commands. It allows your IBM PC or XT to handle up to two billion records per database, 128 fields per record, 4000 bytes per record (fixed length) and 512 kilobytes per record (variable length). dBase III lets you simultaneously access up to ten database files.

Its command assistance mode, dBase Assistant, guides you through dBase III with a menu of prompts to the most common areas of the database. It also includes on-line help, full-screen entry and the ability to modify and generate reports and mailing labels. The manual includes a tutorial (on disk) and reference guide. The tutorial is also available separately for $9.95.

System requirements for dBase III are 256KB of RAM, two 360KB capacity disk drives (or one hard disk and one floppy), monochrome or color display, PC DOS 2.0 and an 80-column printer. Ashton-Tate will continue to sell and support dBase II (now at a new price of $495).

For more information on dBase III or upgrading from dBase II, contact Ashton-Tate, 10150 W. Jefferson Blvd., Culver City, CA 90230. Reader Service number 404.

Multiple Field File System

The Sapana:Cardfile ($195) is a filing system that lets you store and retrieve any kind of information on your IBM PC, PCjr or compatible. The menu-driven program includes extensive sorting capabilities on multiple fields. You can search any of the 24 fields, including up to 24 words in the text, with logical And or Or relations.

Each entry can have six to 24 fields and can accommodate text of up to 255 lines (60 characters per line). The variable-length text efficiently uses only the space required and reallocates the available space to other entries dynamically. It includes a visual line editor.

The filing system is available from Sapana Micro Software, 1305 South Rouse, Pittsburg, KS 66762. Reader Service number 409.

Programmers Can Do Windows

Programmers who want to create software with multiple windows and viewports for the IBM PC, XT and PCjr can do so with Halo 2.0 ($200), a Media Cybernetics graphics toolbox from Lifeboat Associates.

Beyond windows that you can overlap and rotate, Halo offers point, line, arc, pie, circle and ellipse functions, hatch styles, pattern fills, dithering, clipping, animation and image compression. You can set line for multiple style and width, and a rubber-band mode provides high-speed animation and mouse-driven computer art. You can even create pan and zoom effects.

Included with the package is LearnHalo, a stand-alone graphics interpreter/graphics functions tutorial. It executes macro commands created with any text editor or word processor.

Halo supports the IBM color graphics adapter and is available for graphic boards from Scion (PC640), Hercules (The Graphic Card), Orchid Technology (MGA Board), Amdek (MAI Board), Conographics (Conocolor Adapter), Tecmar (Graphics Master) and AST. It is compatible with PC DOS and MS DOS. Versions are available for PC Basic, Lattice C and C86, Microsoft C, Pascal, Fortran, Assembler and APL+. Halo supports mice from Microsoft, Mouse Systems and Summagraphics.

For more information, contact Lifeboat Associates Inc., Dept. C, 1651 Third Ave., New York, NY 10128. Reader Service number 408.

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NEW PRODUCTS

Edited by Amy Campbell

The STM PC supports a full screen LCD, thermal printer, voice and data communications and an Intel 80186.

MS DOS to Go And Make It Fast!

Although these words sound almost like those shouted out at a fast food restaurant, they more aptly fit the cry of the mobile professional who desires just that—a fast and truly transportable IBM-compatible microcomputer. STM Electronics's latest off-beat micro (remember the Pied Piper?), the STM PC, might just fit the bill.

Weighing in at 17 pounds, the STM PC sports an aqua blue back-lit 25-line by 80-character LCD. It offers voice and data telecommunications capability with a built-in 300/1200 bits per second modem and speaker phone and two built-in double-density, half-height disk drives and a 40-column thermal printer.

Using an Intel 80186 microprocessor, the machine runs at a clock rate of eight MHz and produces high-quality color graphics on an optional full-color video monitor. It features a 320 by 200 pixel resolution using 16 colors and a 640 by 200 pixel resolution using four colors.

The standard configuration (256KB of RAM expandable to 512KB) sells for $3449. A desk model minus modem, LCD, printer and speaker phone sells for $2499. The machine is serviceable through Xerox Corp.

For more information on the STM PC, contact STM Electronics Corp., 535 Middlefield Road, Suite 250, Menlo Park, CA 94025. Reader Service number 425.

Heath Turns Blue

Heath Company's latest Heathkit computer is an 8088 processor-based IBM-compatible. The HS-151 Desktop Personal Computer is available in two models in either kit or assembled version. All have 120KB of RAM that's expandable to 640KB, two RS-232C serial ports, one Centronics-compatible parallel port, RGB color output, four open IBM-compatible expansion slots, a detachable keyboard and monochrome video display.

Data storage is available on either single or dual 5¼-inch disk drives, and a third assembled model offers a built-in Winchester hard disk with 10.6MB storage.

The keyboard includes an enlarged L-shaped shift key located at the standard typewriter position. The HS-151 PC boots up in less than five seconds and has a smooth scroll mode.

For more information, write Heath Co., Dept. 349-175, Benton Harbor, MI 49022. Reader Service number 426.

Take another look—this IBM compatible is a Heathkit.

Romar II: Apple Clone

The Romar II is an Apple-compatible computer that runs both Apple DOS and CP/M operating systems.

The detachable keyboard (with the CPU inside) sells for $695 and includes both special function and numeric keypads with caps lock and status keys. Built-in command software lets you preprogram most keys for special functions. It accepts all Apple-compatible disk drives, monitors and so on.

The Romar II has a 6502-based microprocessor (64KB of ROM expandable to 192KB) plus a Z80 circuit card for running CP/M programs. It accommodates two optional slim-line 5¼-inch disk drives and eight expansion slots.

Optional plug-in boards are available for an 80-column mode, an RS-232C serial interface and various languages.

Romar II is a product of Romar Computer Systems Inc., 2210 Claredon St., Suite 103, Woodland Hills, CA 91367. Reader Service number 427.

Turn on Your Computer Remotely

Turn-On is a power controller designed to let you communicate to remote, unattended, powered-down computer systems. It will power-up the computer system during an incoming phone call and leave the power on for the duration of the call for file transfers, electronic mail and other applications. Upon completion of the call, Turn-On turns off the computer.

Turn-On is hardware independent and works with all communications programs and direct-connect modems that can run unattended from the remote end. It also incorporates ac line surge protection.

It comes with software that allows unattended

remote access between IBM PCs, as well as a communications program that lets you transfer binary and text files. Sample Basic code is included for non-IBM PC systems.

Model 1001 ($189) supplies basic power spike suppressions, and Model 1002 ($219) supplies surge and transient suppression.

Turn-On is available from Skyland Systems Inc., 150 Green Valley Road, Scotts Valley, CA 95066. Reader Service number 434.

Elastomer IBM-Compatible Keyboards

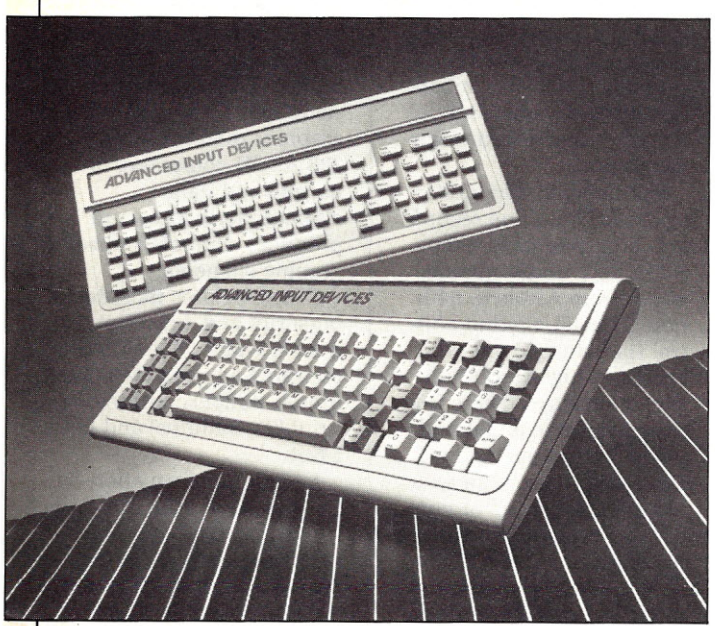
Two full-travel IBM-compatible keyboards with sculptured keys and DIN profile are available from Advanced Input Devices.

The Ergokey EKT ($199) features 83 keys in standard typewriter array. The Ergokey EKI ($199) offers international rectangular-styled keys for quick-change graphics overlays.

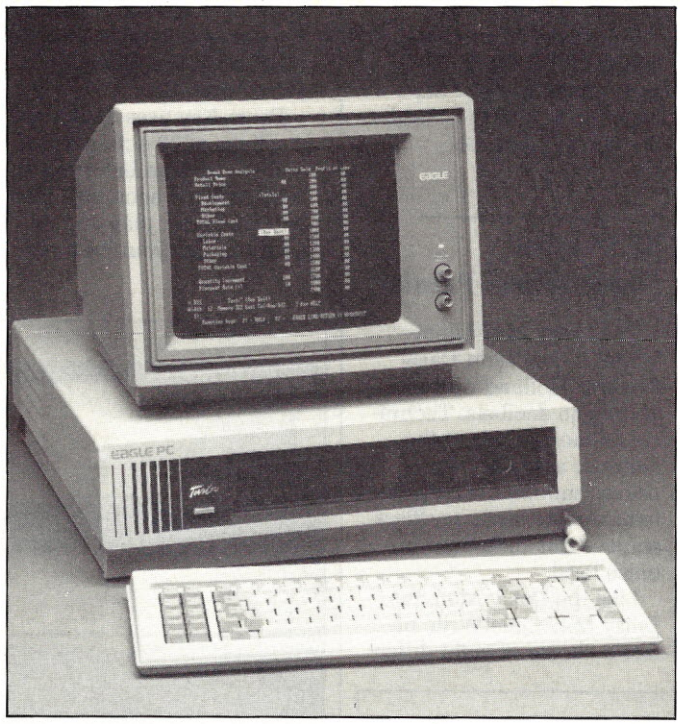
Both keyboards utilize lightweight construction, choice of two-ounce or three-ounce operation force, IBM tactile feel and a special elastomer (nonsilicone) one-piece switch mat. This mat provides greater than 60 million cycles/switch. It also offers spill-proof and ESD protection to the keyboard circuitry.

Compared to capacitance-type keyboards, the Ergokey EKT and EKI contain 75 percent fewer component parts. Both come with a six-foot, shielded coil cord that is IBM plug-compatible.

For additional information, contact Advanced Input Devices, W, 250 A.I.D. Drive, Coeur d'Alene, ID 83814. Reader Service number 432.



The Ergo EKI (top) and the Ergo Key EKT (bottom) utilize high-life elastomer switch mats.



The Eagle Turbo XT has ten megabytes of hard disk storage and a double-density, double-sided 5¼-inch disk drive.

Eagle Computer Adds Turbo Booster

Eagle Computer has announced the Eagle Turbo XL ($4995), a high-performance, 8086-based personal computer. Although compatible with the IBM PC, Eagle claims its Eagle Turbo XL goes beyond the PC in power and speed.

The machine has 10MB of integrated hard disk storage and a speed switch that lets you control processing speed. With one 5¼-inch double-density, double-sided disk drive in standard IBM format, the Eagle Turbo XT is compatible with most popular software programs. It is plug-compatible with IBM PC peripherals.

It includes MS DOS and the BasicA language, and the system can utilize the EagleNet I, Eagle's local area network option. The standard 256KB of RAM is expandable to 512KB.

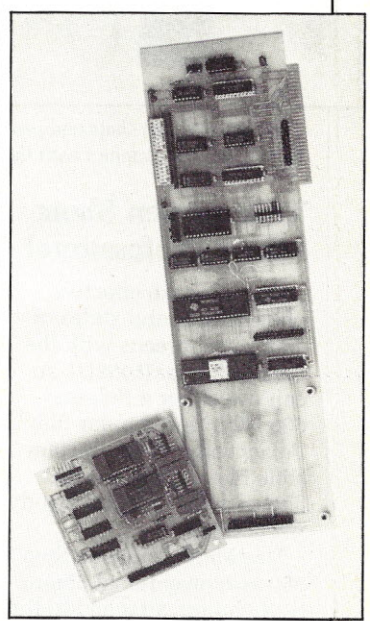
The keyboard has 84 low-profile keys in Selectric-type placement, ten function keys, a ten-key numeric pad and LED indicators on all lock keys. The 12-inch monochrome monitor and 13-inch color monitor with adapter boards are available as options.

Eagle Computer Inc. is located at 983 University Ave., Los Gatos, CA 95030. Reader Service number 428.

IEEE-488 GPIB IBM PC Interface

An IEEE-488 GPIB multifunction board ($395) from Qua Tech Inc. lets you interface your IBM PC and GPIB-compatible instruments for automated measurement and data acquisition applications.

You can connect the board to up to 15 devices and use the PC as a GPIB



This board lets your IBM PC act as an IEEE-488 interface GPIB controller of up to 15 devices.

system controller. You can program other devices on the GPIB as talkers, listeners or controllers.

The board also has one programmable interval timer and one parallel port that accepts analog-to-digital and digital-to-analog converter modules, a reed relay or stepper motor control (from $75 to $495).

Available software ($100) lets you implement the GPIB functions. There are more than 30 macro commands, and you can use Basic, assembly or other languages for the application programs.

For more information, contact Qua Tech Inc., 478 E. Exchange St., Akron, OH 44304. Reader Service number 431.

35mm camera bracket.

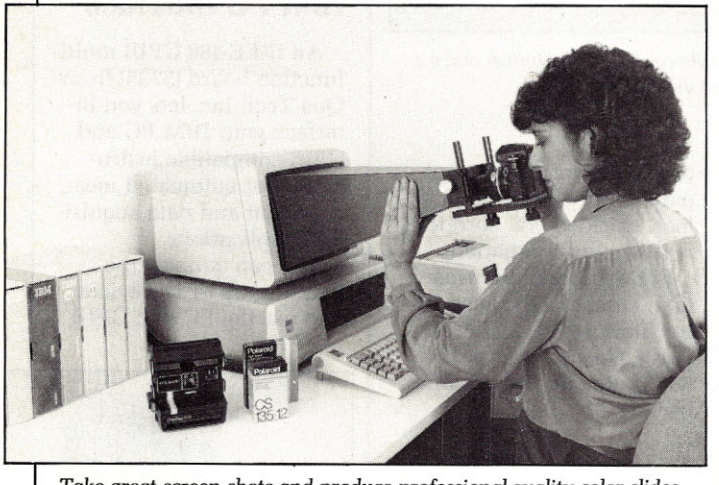
For more information, contact NPC Photo Division, 1238 Chestnut St., Newton, MA 02164. Reader Service number 435.

55 Decibel Daisy-Wheel Printer

The Daisy M45 QuietWrite ($1845) from Daisy Systems Holland operates at only 55 decibels. Technical enhancements to the hammer assembly, improved motion control systems and acoustic mufflers achieve this reduction in noise level.

Like the Daisy M45, the Daisy M45 QuietWrite offers a choice of eight different interchangeable interface modules and prints at 40 cps. It can handle forms up to 15 inches in width. The print line is 132 columns at ten cpi, and 158 columns at 12 cpi.

For more information, contact Daisy Systems Holland through LaMantia Communications Inc., 24238 Hawthorne Blvd., Torrance, CA 90595. Reader Service number 439.



Take great screen shots and produce professional-quality color slides from computer graphics with the Screenshooter.

Take Screen Shots Like a Professional

You can take effective photographs and slides of computer screens with the Screenshooter ($169). You can use either a Polaroid 600 High Speed color film, Polachrome 35mm instant slide file or conventional 35mm color and black and white films.

Use a Polaroid One Step 600 or conventional 35mm SLR camera attached to the Screenshooter CRT hood. The outfit includes a Polaroid One Step 600 camera, CRT hood, CRT hood adapter, diopter lens and

March to Apple Drum Roll

Drum-Key ($139) is an electronic music interface board and software package for use with stereos, electric instrument amplifiers and your Apple II.

Drum-Key uses digital recordings of 28 actual drum and percussion instruments with realistic accuracy. You can compose, play and record on disk your own percussion sounds or use the 100 built-in rhythm patterns and 26 songs.

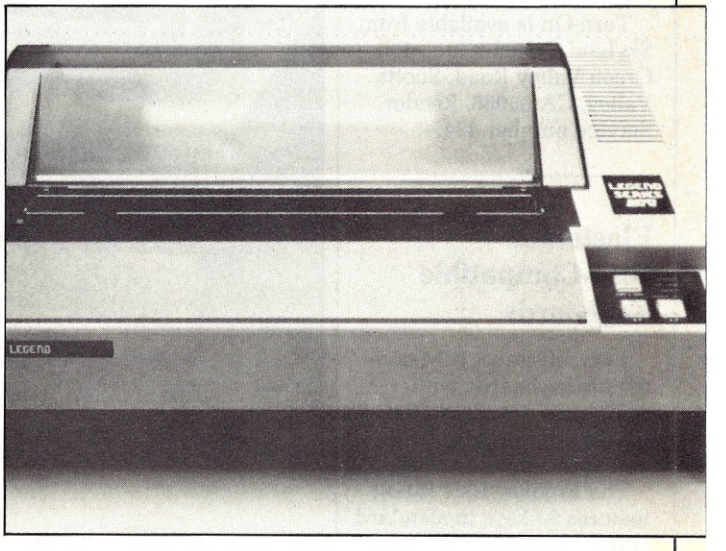
The product is useful for both recreational and serious applications such as teaching basic music theory. The sounds include kick bass, snare, four different tom-toms, a variety of cymbals, cowbell, tambourine and six sounds made by conventional drum synthesizers.

Features include multitrack and real-time recording, programmable tempo (128 rates), programmable notes (from whole to 64th note triplets), rhythm control (14 values to vary the beat) and high-resolution screen displays. There is a programmable audio and video metronome and a sync out for use with external synthesizers or connection to multiple drum machines.

For more information or to order, write Peripheral Visions Inc., Great Valley Parkway, Malvern, PA 19355. Reader Service number 429.

Dot Matrix at 80 cps for $350

The Legend 800 dot-matrix printer ($350) produces 80 columns and prints bidirectionally at 80 characters per second. It features a replaceable print head with a lifetime of more than 30 million characters.



The Legend 800 dot-matrix printer produces five million lines of mean time between failures.

The printer has a tested mean time between failure rating of more than five million lines. It functions in alphanumeric, semigraphics and bit-image graphics modes, features 228 ASCII characters in normal and italic alphanumeric fonts and produces symbols and semigraphic elements.

Other features include superscript and subscript, double width (40 columns), compressed print (142 columns), double/compressed print (71 columns) and bold print.

For more information on the Centronics parallel-type interface (serial interface optional), contact CALABCO Peripheral Division, 14722 Oxnard St., Van Nuys, CA 91401. Reader Service number 438.

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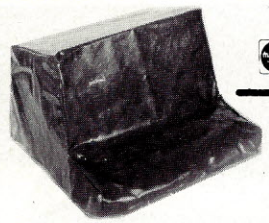

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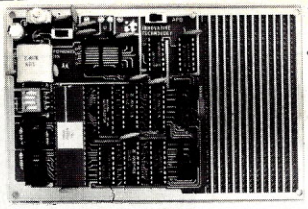

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MC6801 APPLICATIONS PROTOTYPE BOARD

The APB is a small board which supports the MC6801 family of microcomputers. It is described in Motorola's application note AN799. A typical 6801 member contains an enhanced 6800 processor, 2K bytes of ROM, 128 bytes of RAM, a 16-bit programmable timer, parallel I/O, and a serial communications interface. In addition to the resources of the 6801, the APB provides an additional 2K bytes of EPROM (TMS2716), 2K bytes of RAM (2114L), and a full duplex RS-232 interface. It also supports special versions such as the 6801G1 with its LILbug* monitor; and provides on-board programming of the 68701 EPROM version.

The APB is an excellent **educational aid** which allows for evaluation and familiarization of 6801 family members . . . It is great for **prototype development.** Since the 'nuts and bolts' are already in place, the designer need only add the necessary interface circuits for a particular application . . . It can also be used as a simple cost-effective **dedicated controller** for those limited quantity applications.

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APB-1 Bare board with documentation	$ 19
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APB-4 Above with four 2114L RAMs	$129

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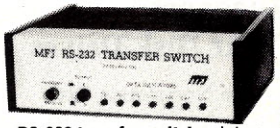

Multi-function RS-232 transfer switches let you switch your computer among printers, modems, terminals, any RS-232 peripherals; monitor data/line failure, protect data lines from surges, and use as null modem for less cost than a switch alone.

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MFJ-1241	$99.95	2	2	MFJ-1245	$169.95	3	5
MFJ-1242	$119.95	2	3	MFJ-1246	$199.95	5	5
MFJ-1243	$119.95	1	4	MFJ-1247	$99.95	1	2
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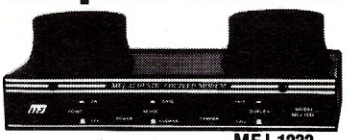

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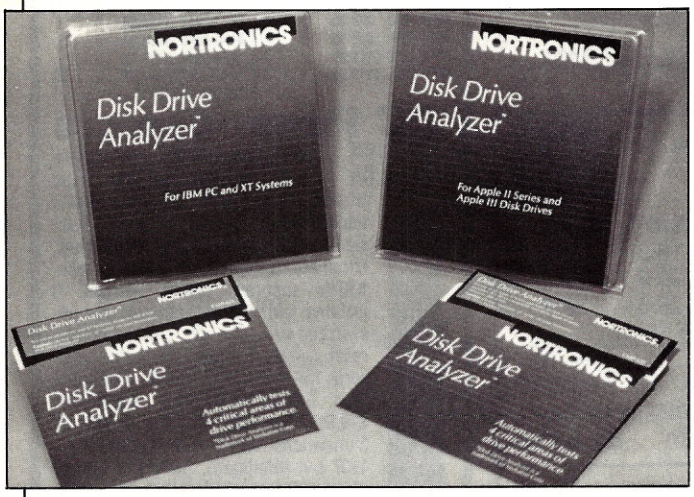
Analyze and Diagnose Your Disk Drives

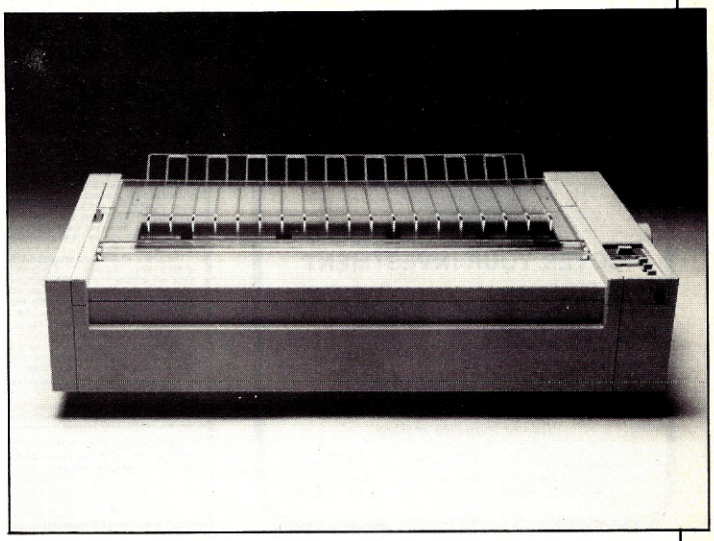
The Nortronics Disk Drive Analyzer ($39.95) is a fast, easy and accurate way to check the performance and reliability of a system's disk drives. Check your Apple II, III or IBM PC drives for radial alignment, rotation speed, read/write ability and clamping accuracy of the drive's read/write heads.

Portables or computers frequently moved are susceptible to drive problems. Use of the analyzer can help protect against error or data loss caused by faulty drives.

For more information, contact Nortronics Company Inc., 8101 Tenth Ave. North, Minneapolis, MN 55427. Reader Service number 436.



Don't let drive problems drive you crazy. Check and diagnose your drives regularly with these disks to spot trouble before it causes harm.



Apple's Imagewriter dot-matrix printer is now available in a wide carriage model.

Wide-Carriage Imagewriter

A wide-carriage model of Apple's Imagewriter dot-matrix printer ($749) is suited for producing documents that require wide paper.

It handles paper sizes from three to 15 inches wide and operates with Apple II, III and Macintosh computers. It prints in a seven by nine dot matrix at a rate of up to 120 characters per second. It has eight character fonts and variable resolution, pitch and line spacing.

For more information, contact Apple Computer Inc., 20525 Mariani Ave., Cupertino, CA 95014. Reader Service number 437.

384KB RAM IBM PC Multifunction Card

Ideamax 384, a plug-in multifunction card with up to 384KB of RAM for the IBM PC and XT, is available with up to four of the following options: serial interface, parallel interface, clock/calendar with removable battery and a game port.

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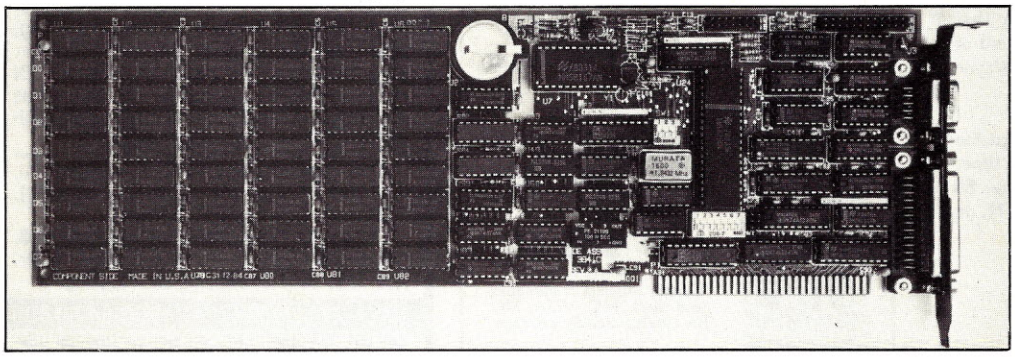

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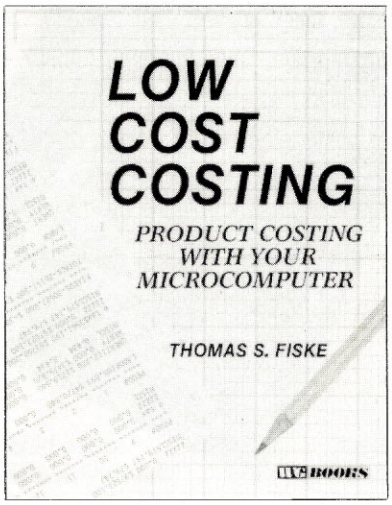

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BOOK REVIEWS

Edited by Nancy Kipperman

Hero 1: Advanced Programming And Interfacing

Mark Robillard
Howard W. Sams & Co., 1984
4300 West 62nd St.
Indianapolis, IN 46268
Softcover, 234 pp., $16.95

One of the exciting and educational entries in robotics today is Heathkit's 1000 dollar plus mechanical marvel, Hero 1—the robot about the unheroic size and shape of a wastepaper basket. A book that may assist owners of this almost-a-robot in their considerable labors and puzzlements that accompany Hero 1 ownership is Mark Robillard's *Hero 1: Advanced Programming and Interfacing.*

This book will be instructive and useful to Hero owners. Moreover, the book is provocative to bystanders like me.

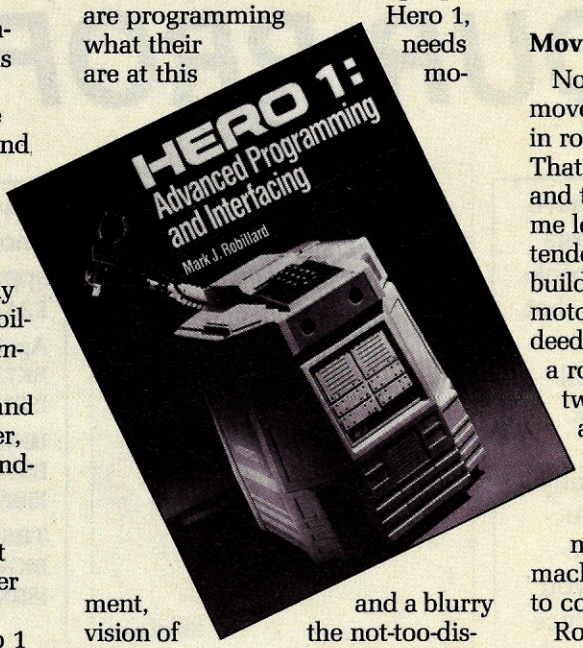
My first impression of Robillard's book was astonishment. It seems to take a veritable engineer to make appropriate use of this book and, in fact, program Hero 1 to do what the nonrobotics engineer imagines to be essentially simple activities—move across the room, or even more complex, move across the room without knocking anything over or crashing into anything and self-destructing. Indeed, an engineer is required to accomplish these tasks, I fear, with a Hero 1, even with the aid of *Hero 1: Advanced Programming and Interfacing.*

Mixed Audience

The book has as its main audience a very small and distinguished group: those people who own Hero 1 robots and are trying to make some headway in that staggering problem of programming Hero to do sophisticated tasks.

But there is another audience that Robillard is addressing—people like me and perhaps you—the large group of nonHero 1 owners who are still distinguished by an interest, perhaps a knowledge, in the development of robotics.

For that second, larger audience, this book doesn't effectively serve as an introduction to either the Hero or to equivalent robots available; rather the book helps to give some idea of what kind of people are programming Hero 1, what their needs are at this moment, and a blurry vision of the not-too-distant future, in which sophisticated robots will be present in considerable numbers.



It takes a person who is, to say the least, conversant with modern IC hardware to be able to effectively use the Hero 1 and this supplementary textbook. Hero 1 is largely complexity in a machine, rather than intelligence or should I say the possibility of intelligence. In fact, that may be the mysterious attraction such machines as Hero 1 hold for us who know that it isn't yet a robot—it's a lot of motors and IC chips waiting for the Master Control Program.

Robillard's Hero 1 book certainly contrasts remarkably with some of the other books I have around me on robotics these days. One book, for instance, *The Intimate Machine or Close Encounters with Computers and Robots*, depicts a very different encounter with a robot from Robillard's. When Neil Frude talks about a close encounter with a robot, he means perhaps a social relationship—how to deal with an unfriendly robot or how to reject the advances of an amorous one. Robillard's idea of a close encounter with Hero 1 involves taking the top off it and sticking your head and logic probe into its internals.

Moving Force

Now I have to confess to being moved by one of the two big forces in robotics more than the other. That force is largely programming, and the other force, which moves me less, is hardware (no pun intended). Most prospective robot builders see the hardware (read, motors) as quite essential. And indeed, to quote Robillard, "What is a robot without motors?" These two socio-technological forces are part of a most remarkable phenomenon that robotics has brought about in recent history. Never before have so many labored so long to build machines that nobody knew how to control yet.

Robillard says, "What's a robot without motors?" and people from the opposite extreme say, "What's a robot without half a meg of memory?" Of course, it's obvious that if success is to be found, it will be found at a point between these two directions. The motor-bound robots like Hero 1 will have to increase their brain power; the eggheads like Chess 7.0 are surely going to have to increase their dexterity and perceptual abilities.

Users of Robillard's book will find themselves with some powerful old perception elements, but will not yet find perception systems. For instance, using the eye (or more appropriately, the light sensor) in Hero 1 involves decoding the raw visual data, the electrical impulses that represent changes in light level. Yet, what the programmer of Hero 1 really

needs to know is not whether the room lights are on or off, or if the light intensity level is high or low. He needs to be able to "see": is that a friend or an obstacle in front of the Hero? He doesn't want to know the instant-to-instant sound pressure level that he can get from Hero's sound system. He needs to know if there's some music, some noise or the robot's mother is calling to him, "Hero, come home, it's time for dinner."

By the same token, the artificial intelligence programmer working in lab and terminal, without sensors or motors, needs to be able to get input to his program that is closer to the kind of input light intensity level and sound intensity level that Hero is privy to.

Find the Rewards

Advanced Programming and Interfacing provides some of the expected rewards for the growing group of owners and users of Hero 1. Those rewards include found and corrected mistakes in the Hero manuals, resolved ambiguities in the manuals and important information that has been left out of the manuals. It provides commiseration for users who have found how difficult it is to stop Hero on a dime and how difficult it is to control reverse motion. Some new applications and interfaces, as promised, are detailed.

One reason I find this book such an enjoyably informative treatment of Hero 1, of which I'm not an owner but a curious party, is that the author is, in fact, a real enthusiast and productive worker, no small virtue in robotics.

Perhaps the most valuable interfacing that can be accomplished with the use of this text is the building in of an RS-232C port—slightly less valuable, perhaps, is the procedure for building a remote keypad. The hex keypad is the primary input device that, because of Hero's small stature, results in regular backaches, according to the author. The use of a remote keypad that can be held by humans in the upright position presumably solves that problem.

Another very valuable accessory, for which a construction procedure is presented, involves using both of these ideas, the remote keypad and RS-232C link, to produce a radio link. Thus the remote keypad can be used at some distance, typically, the author claims, up to 75 feet.

Hero needs to know if that sound is music, noise or his mother calling, "Hero, come home, it's time for dinner."

Robillard speaks of improving the operating system for Hero and incorporating some of the virtues of its eight-bit microprocessor, the 6808. He hints about using a different, interrupt-based program structure. Of course I can't help wondering why a stronger, newer microprocessor like the Z80 with its more complex interrupt capabilities wasn't chosen. Nevertheless, the author seems interested in utilizing the interrupt-based system and he even gives a rough schematic suggestion for using a second 6808 as a coprocessor.

It finally turns out, I should add, that an engineer is not required to train Hero to cross the room nondestructively. Because Hero incorporates the powerful pendant teaching functions, nonengineers stand an excellent chance of pendanting Hero 1 through a complicated path while Hero stores that path. The path is embedded in a program and may then be rerun.

Perhaps the bottom line on the value of this book is, for a mere $17, it definitely provides, if not some concrete help, some sympathetic story telling to what I can only imagine are a small, rather lonely group of users, something like Maytag washer repairmen. So, I certainly say thumbs up for Mark Robillard's *Hero 1: Advanced Programming and Interfacing.*

Lance Sherman
Decatur, IL

Programming in C for the Microcomputer User

Robert J. Traister
Prentice-Hall Inc., 1984
Englewood Cliffs, NJ 07632
Softcover, 208 pp., $16.95

Programming in C

Stephen G. Kochan
Hayden Book Company, 1984
10 Mulholland Drive
Hasbrook Heights, NJ 07604
Softcover, 384 pp., $18.95

Programming in C by Stephen G. Kochan and *Programming in C for the Microcomputer User* by Robert J. Traister are both written to appeal to the computer hobbyist or applications programmer rather than an operating systems programmer.

To quickly define the difference between these two books, I'd say that Kochan's book teaches you to be comfortable writing programs in C with a slight Fortran slant, whereas Traister's book shows the Basic programmer who doesn't like structured programming that he can suffer through learning C. There are really more differences, but I can explain those better by dealing with each book separately. I'll start with Kochan's book.

Offers Quick Rewards

This is a substantial book of almost 400 pages written in easy-to-use textbook style. Each chapter introduces a part of the C language, uses sample programs to illustrate the use of the feature and offers exercises at the end of the chapter to test your understanding. Unlike books written for systems programmers, this book offers quick rewards in the form of working programs within the first few pages. This prevents hobbyists learning C as a first or second language from getting frustrated.

The slight Fortran slant I mentioned involves introducing floating-point (real) numbers early on and then using them in the type of examples you'd see in a beginning Fortran text.

Now let's look at the structure of the book. A short introduction covers C's history, followed by a chapter on fundamentals that addresses programming, higher level languages, operating systems and compiling programs.

The next chapter illustrates the basic structure of a C program, with examples and exercises to reinforce what you've learned. Variables, constants, different types of data, arithmetic expressions and automatic conversion between different data types are explained and illustrated with examples. Kochan does an excellent job of anticipating strange things that may happen to you and explains them before you're frustrated.

And Next...

The following chapters introduce program looping, decision making, arrays, functions and variables. At this point in the book, you should feel comfortable writing mathematical programs in C. Following sections present structures and pointers (hard concepts to visualize) and a chapter on working with bits, which includes bit operators, shifts and bit fields. The preprocessor, the typedef directive and concepts that are related to working with real programs in a system environment are next. The last chapter deals with a grab bag of unaddressed topics, including unions, the null statement, comma operator, register variables, command line arguments, dynamic memory allocation and more.

Following the main part of the book are six appendixes that summarize the language, present common mistakes, explain the common library calls, show how to use the C compiler and lint utility under the Unix operating system and finally supply you with an ASCII conversion chart. The language summary does an excellent job of explaining each command, taking enough space to make it readable but concise. The explanations are in English, not in the form of unreadable syntax diagrams.

The appendix on common programming mistakes, although only four pages, is one of those things that should be on the wall. It includes errors, which fairly experienced C programmers make too but won't admit. This section could only have been written by someone who has actually used C. It strikes home.

In summary, this is an excellent book for anyone who wants to learn C for use in writing applications programs. The book is well-organized, accurate and filled with good examples and exercises. It could be used in a classroom environment but is detailed enough to be used for self-instruction. The appendixes should also be useful for reference once you've learned the language.

If I had to make a negative comment, it would be that there are no answers to the exercises. This is a minor problem as the exercises either ask what output you'd expect from a program (which can be checked by running the program) or ask you to write a program with well-defined results.

The other book, *Programming in C for the Microcomputer User*, by Robert Traister, is a smaller book, designed to be an introduction rather than a complete coverage of the C language. I see two unfortunate things about this book. First, the author learned C using a nonstandard implementation, and second, he attempts to translate Basic commands to C on a statement basis rather than addressing the different approaches suitable for Basic and C.

The use of the nonstandard implementation makes almost half of the book unusable as an accurate learning tool unless you are using the SuperSoft C compiler. It is disappointing that Traister spent so much of the book dealing with information that is not generally true in the world of C.

The statement-level comparison of Basic and C is also a mistake. For example, the first flow control statement he introduces is the Goto, something that is rarely used in C. The result is that a Basic programmer is taught to preserve his unstructured style in a language with much more eloquent ways to perform tasks.

Chapter 2 starts with the sentence, "When I was assigned to write a book...". The result of this attitude is a book that reads more like a diary of the undesirable experience of having to learn C than a bridge from Basic to C.

In conclusion, I see a real need for a book designed to help Basic programmers become proficient C programmers. If you are using SuperSoft C and want to see what type of experiences another Basic programmer had attempting to learn C, this book will satisfy that desire. Otherwise, I don't see it as that Basic-to-C connection we are waiting for.

Phil Hughes
Seattle, WA

Advanced Pascal Programming Techniques

Paul A. Sand
Osborne/McGraw-Hill, 1983
2600 Tenth St.
Berkeley, CA 94710
Softcover, 370 pp., $19.95

I'll end all the suspense right here at the start; this is an *excellent* book.

In the introduction, the author claims that the reader "should have...completed an introductory course or text in Pascal programming and be able to read Pascal program listings and write simple Pascal programs." But even if you can't satisfy these basic requirements, you should still be able to learn from this book. If you're interested in doing a good job as a systems analyst or programmer, you owe it to yourself to read this book, whether you're interested in Pascal or not. And I'm not just talking to beginners; there's a lot in this book for computer workers at all levels.

Take a Trip

A short trip through this book should show that there's something here for you.

The introduction describes the primary emphasis of the book, which is to present complete and

usable programs, introducing algorithms and data structures as they're needed. This chapter also explains why it's important to write portable Pascal programs and why you can't always do this.

Chapter One examines the qualities of a good program from two viewpoints, that of the programmer and that of the user. (Books of this type too often ignore the user viewpoint.)

Chapter Two discusses CRT techniques and begins with "As we have seen, the most important criterion for the quality of a program is the way in which it interacts with the user," then develops screen-oriented routines with this criterion in mind.

Interactive input is the subject of Chapter Three. It designs and programs the input routines that are to be used for the rest of the book.

Chapter Four discusses crunching numbers and develops a program that will turn your computer into a calculator that can evaluate arithmetic statements you enter from the keyboard. An excellent discussion on the use of syntax diagrams in the design of application programs is included.

Chapter Five develops routines for manipulating and printing text files. (Some of this chapter is specific to Apple Pascal and 6502 assembler language.)

Games and strategy, the topic of Chapter Six, develops a human vs computer version of the game of *Reversi*. It contains an interesting introduction to game theory as it applies to games of this type. Two animation programs that simulate movement of objects are covered in Chapter Seven. Chapter Eight alone is worth more than the price of the book. In 96 pages, the author designs and programs a complete spreadsheet program. This program is similar to the many spreadsheet programs that are now available, some at very high prices. In the appendix, the author explains how to program around some of the nonstandard, Apple-specific features that he used in the book.

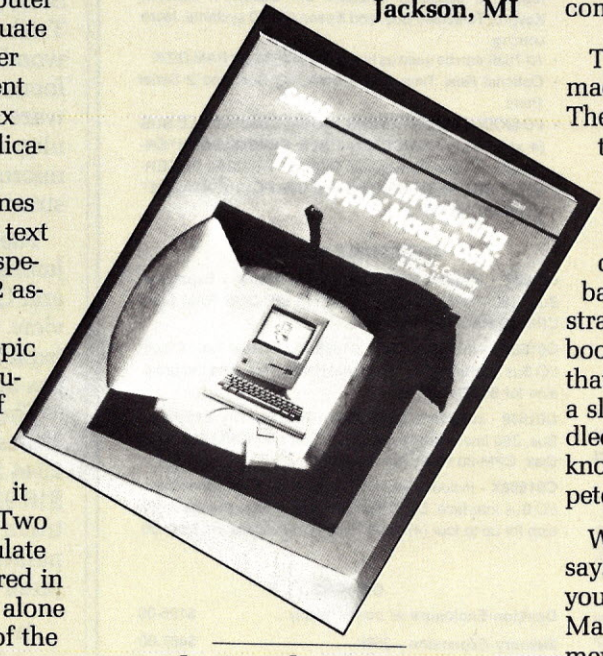
This book is written as one whole text, not as a series of disjointed applications. What is taught in one chapter is used later in the book.

Throughout this book, the author designs his algorithms with ease of use as the main criterion. The algorithms are developed logically and explained clearly. In some cases, algorithms are presented in pseudocode, then in Pascal and finally, in asembler. This method of coding assembler programs in a higher-level language first is an excellent technique that is too rarely used.

What more can I say? I killed all the suspense at the beginning by telling you that this book is excellent. I hope that this short discussion of its contents has helped convince you that you should run out and buy it.

I don't know Mr. Sand, but I hope his name begins to show up a lot more on books and in magazines.

Alfred J. Bruey
Jackson, MI



Introducing the Apple Macintosh

Edward S. Connolly and
Phillip Lieberman
Howard W. Sams & Co., 1984
4300 W. 62nd St.
Indianapolis, IN 46206
Softcover, 188 pp., $12.95

When Apple announced the Macintosh, it also introduced a communicable disease into the world. I call it the MacCute plague. It is easy to contract and virtually impossible to get rid of. It's infectious, and, at least in one case, fatal. The disease starts when you add the prefix "Mac" to things like word processing and graphics programs (MacWrite, MacPaint). From there, it spreads to things like disk and filenames (MacDisk, MacFile, MacBackup) and from there it's endemic. It reaches into politics (MacMeese) and even rock 'n' roll (MacJagger).

A fatality of note is the first book-length introduction to the Macintosh from Howard W. Sams & Co. *Introducing the Apple Macintosh* by Edward S. Connolly and Phillip Lieberman succumbs immediately to terminal MacCute. Information about how the computer began is MacHistory. The people who worked on it are the MacEngineers. The computer works MacMagic. If you buy one, you become a MacUser.

The available software for the machine is the MacVironment. The authors even refer to what they've written as the MacBook.

But even without such an advanced case of MacCute, the book is moribund. It's filled with cliches, empty jargon and plain bad prose. Witness the following straight-faced sentence:"...this book, like the computer, is a tool that will help your transition from a slow-paced desktop-bound, muddled worker to a fully productive knowledge worker ready to compete in the eighties."

What's worse is that the book says virtually nothing beyond what you can find out by reading the Macintosh manuals or the documentation attending the software. Unlike earlier systems and software whose documentation needs clarification, the Macintosh system manual and software instructions are already models of simplification. This book simply repeats that simplicity and carries it a step further into condescension.

To be fair, I suppose the book, an attractively designed and sturdy paperback, would be useful to someone who hasn't purchased a

Macintosh and who would like to know what it's like in the most direct and uncomplicated terms. The writers seem like sincere enthusiasts and not crass opportunists out to make the first quick MacBuck on the MacBoom. But these virtues can't outweigh the risk of contracting the deadly MacCutes and eventually going MacMad.

Michael Sexson
Bozeman, MT

From the MC Bookshelf

If you're interested in free software, two recent books list public-domain software available for the IBM PC. *Free Software for the IBM PC* by Bertram Gader and Manuel V. Nodar ($9.95) is published by Warner Books, 666 Fifth Ave., New York, NY 10103. A new directory from the PC Software Interest Group (1556 Halford Ave., Suite #130S, Santa Clara, CA 95051) lists hundreds of programs for IBM PCs and compatibles and costs $4.95 plus $1 for postage and handling. Its title is *Directory of Public-Domain (and User-Supported) Software for the IBM Personal Computer.*

John Zarella has edited a three-volume book set titled *Microprocessor Operating Systems* (Microcomputer Applications, 827 Missouri St., Fairfield, CA 94533, $12.95 per volume), which contains descriptions of "the most important microprocessor operating systems currently available." Each chapter is written by an industry leader who is expert on a particular system.

Designing with the 8088, also by Zarella from Microcomputer Applications ($19.95), presents an introduction to hardware and software design using the 8088 microprocessor. *The 99000 Microprocessor* by Avtar Singh and Walter A. Triebel (Prentice-Hall Inc., Englewood Cliffs, NJ 07632; $23.95) focuses on the architecture, software and hardware interface techniques of the 99000 family of 16-bit microprocessors from Texas Instruments.

The Epson QX-10 User's Guide by James M. Hansen (Scott Foresman and Co., 1900 East Lake Ave., Glenview, IL 60025; $17.95) "thoroughly explores the architecture, capabilities and uses of the QX-10."

The IBM PC Connection by James W. Coffron (Sybex Inc., 2344 Sixth St., Berkeley, CA 94710; $16.95) shows how a PC can control a burglar alarm system, temperature, lights and other noncomputer devices.

An Introduction to Computer Science Using the Turing Program Language by R.C. Holt and J.N.P. Hume (Reston Publishing Co. Inc., 11480 Sunset Hills Road, Reston, VA 22090; $24.95) introduces you to a new computer language developed at the University of Toronto. Turing is "a general purpose language that handles science and engineering calculations, computer science applications, as well as alphabetic information required by business and humanities."

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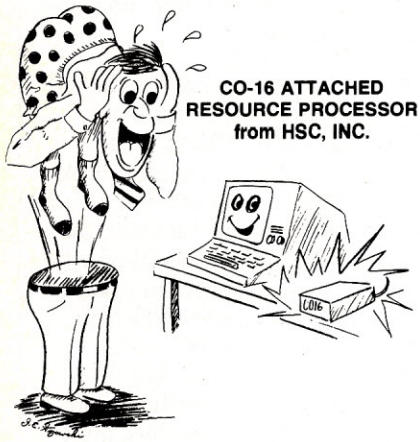

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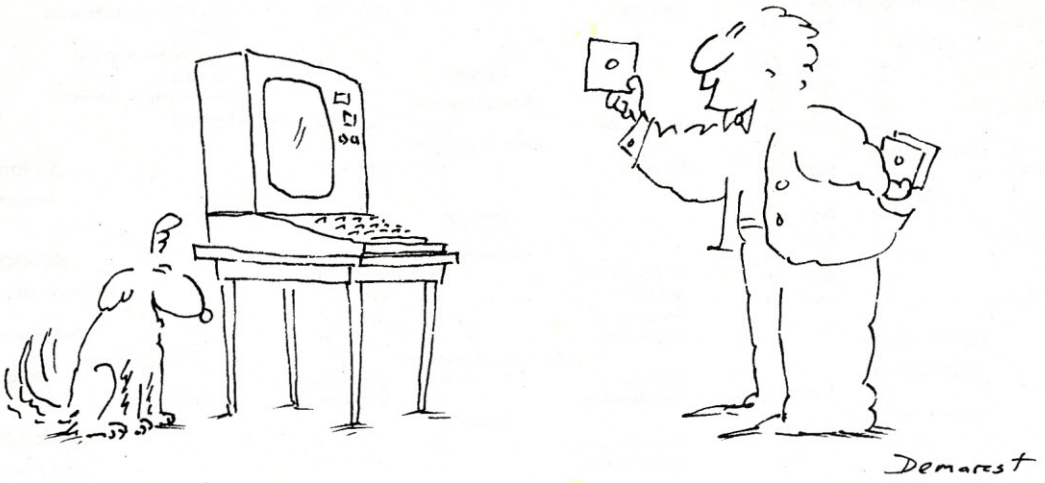

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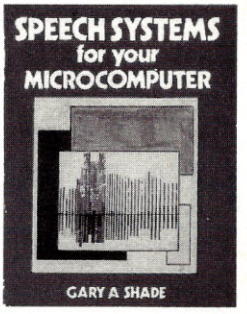

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Speech Systems for Your Microcomputer is available for $14.95. You can call toll-free for credit card orders, **1-800-258-5473**. Or you can mail your order with check, money order, or complete credit card information to: **Wayne Green Books, Retail Sales, Peterborough, NH 03458**. Include $1.50 for the first book, $1.00 for each additional book for postage and handling. Orders are payable in U.S. dollars only. Allow four to six weeks for delivery. WGBooks are available at your local bookstore. Dealer inquiries invited.

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CALENDAR

August 1–3
Eugene, OR

The Center for Advanced Technology in Education at the University of Oregon's College of Education is sponsoring its third annual conference, **The Computer: Extension of the Human Mind.**

The conference is geared toward individuals responsible for school- and district-level use of computers and computer-related technology. General and small interest group sessions will be offered along with films and videos related to computers in education. An exhibition is also slated in addition to pre- and post-conference workshops.

Academic credit is also available. For more information, contact the Summer Conference Office, College of Education, University of Oregon, Eugene, OR 97403.

August 2–5
Tampa, FL

Compushows Inc. continues its 1984 schedule with the first annual **Tampa Bay Computer Show and Office Equipment Exposition**, which will be at the Curtis Hixon Convention Center in Tampa. The shows cover hardware and software for business, industry, government, education and personal use.

For more information, telephone 800-368-2066, or from within Maryland, 301-263-8044.

August 4–8
Rensselaerville, NY

"How can we use science and technology to get where we want to go?" This and many other questions on artificial intelligence will be the subject of a four-day independent hearing sponsored by the Rensselaerville Institute, **Artificial Intelligence—Are We Being Outsmarted?**

"Expert witnesses" Isaac Asimov and Marvin Minsky will preside over the hearing, designed to be an open forum for concerned citizens that will be "aided but not dominated" by experts. The goal of the conference is to develop a human impact statement for artificial intelligence.

A limited number of scholarships are available. For more information, contact The Rensselaerville Institute, Rensselaerville, NY 12147; 518-797-3784.

August 9 and 10
San Francisco, CA

The Practising Law Institute of New York is sponsoring a seminar, **Computer Software: Protection and Marketing**, at the Four Seasons-Clift Hotel in San Francisco August 9 and 10. The program will focus on recent legal developments in protecting and marketing software.

Among other things, the conference will examine the recent Supreme Court decision regarding Sony and other court decisions on software infringements. Several noted specialists on copyright laws and trademarks will chair the conference.

For further information, contact Practising Law Institute, 810 Seventh Ave., New York, NY 10019; 212-765-5700.

August 10 and 11
Houston, TX

Haywood and Bates is sponsoring a series of seminars on two popular spreadsheet programs throughout the summer and fall. In August, **dBase II and Lotus 1-2-3: Fundamentals and Applications** will travel to Houston. Each seminar offers an introduction to dBase II, an advanced programming course and a course on business applications of 1-2-3.

For additional information, telephone Walter Dinkins at 214-739-8737.

August 13–16
Madison, WI

The University of Wisconsin-Madison is coordinating a **Microcomputers and High Technology in Vocational Education Conference**, which will be at the Concourse Hotel, Madison, WI.

The conference itself runs August 14–16; formal classes start on August 13. More than 100 concurrent sessions will be offered, dealing with instructional and administrative computing in vocational education programs. Also on the agenda are presentations, videotaped programs, hardware and software displays and a keynote speech by Dr. Gene Bottoms.

For further information, contact Dr. Judith Rodenstein or Dr. Roger Lambert, University of Wisconsin-Madison, 964 Educational Sciences Building, 1025 W. Johnson St., Madison, WI 53706; 608-263-4367 or 608-263-2704.

August 19 and 20
New York, NY

August 22 and 23
San Francisco, CA

The Yankee Group continues its 1984 seminar schedule in August with two **Telecommunications** conferences. For more information, contact Lisa Caruso, The Yankee Group, 89 Broad St., Boston, MA 02110; 617-542-0100.

August 19–23
San Francisco, CA

The third annual international conference on **Computers/Graphics in the Building Process** is all set to begin August 19 at the Embarcadero Center in San Francisco.

Sponsored by the National Computer Graphics Association, the conference will feature an exhibit, paper presentations and tutorials emphasizing the impact of high technology developments in the building industry.

CALENDAR

For more information, contact BP '84, 2033 M St. NW, Suite 333, Washington, DC 20036; 202-775-9556; telex BP 248301 RCAW UR.

August 26–30
Boston, MA

Managers and staffs of information centers now have a conference just for their specific needs—the premiere **Information Center Conference and Exhibition** is designed to assist companies in the selection, purchasing, support and standardization of hardware and software for information centers.

The conference, which will be at the Hynes Auditorium and the Sheraton Boston, will feature more than 60 educational sessions and an exhibit of relevant products.

For further details, telephone Loretta Wolman, conference manager, at 617-542-0146.

September 3–5
London, England

The City on the Thames will play host to the **IBM System User Show** September 3–5. The show is designed to be the main European exhibition for IBM users, from mainframes to micros.

The exhibition will feature product displays from both British and international companies. A conference, featuring eight half-day congresses and 15 well-known IBM specialists, will be held in conjuction with the exhibit.

For more information, contact Peter Walker Associates, 32 Fitzroy Square, London W1P 5HH, England; 01-388-9871.

September 5–7
Anaheim, CA

The National Software Show, a Raging Bear Productions event, is scheduled for the Anaheim Convention Center September 5–7. The software-only show will feature more than 800 booths for new products and product update announcements and displays.

More information can be obtained from Philip Russell—call 415-924-1194 or, from outside California, 800-732-2300.

September 6–8
Washington, DC

The capital city will host a workshop on September 6–8, **Personal Computer and STD Computer Interfacing for Scientific Instrument Automation**. The workshop is sponsored by Virginia Polytechnic Institute and State University.

Sessions are designed to be intensive and personal—participants will be wiring and testing interfaces for themselves. For details, contact Dr. Linda Leffel, CEC, Virginia Tech, Blacksburg, VA 24061; 703-961-4848.

March 13–15, 1985
Call for Participation

The fifth annual **Microcomputers in Education Conference** has issued a call for participation. The theme of the conference is "Tomorrow's Technology"; emphasis will be placed on integration of computer languages and technology into the educational environment. For a copy of the speaker proposal form, please contact Donna Craighead at 602-965-7363.

CLUB NOTES

Southeast CT PC User's Group

Meetings of the Southeast Connecticut PC User's Group are open to the public. Annual dues of $10 allow the opportunity to take advantage of group purchases and use of the group's public domain library and HW/SW database.

For more information, contact Raymond Kambeitz, c/o SE CT PC User's Group, PO Box 180, West Mystic, CT 06388.

NYC Sanyo Group Now Open

The New York Sanyo User's Group officially formed in January 1984 to attract users from Manhattan, Brooklyn, Queens, Long Island, New Jersey and Connecticut. The group meets regularly to exchange software, organize collective trips to computer shows, listen to guest speakers and exchange experiences and tips. Anyone interested should contact Patrick Yanez, NY Sanyo User's Group, PO Box 182, Times Plaza Station, NY 11217.

Olympian Club Forms in Greece

A new club, the Olympian ComputerClub, has been founded in Athens, Greece. It's not a specific user's group as many computers are represented. The club meets at Hellenikon Air Base, and correspondence can be sent through the military mail system c/o Paul A. Mullens, Box 4277, APO New York, 09223.

Apple PIE Writers

This new national user's group is for Apple users of the PIE and PIE Writer word processors. Its newsletter ($10 a year) is a clearinghouse of ideas and techniques from members. To join, contact Monty Lee and Mike Weasner, coordinators, Apple PIE Writers, 12841 Hawthorne Blvd., Box 589, Hawthorne, CA 90250.

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CLUB NOTES

IBM PC User's Group Of Winnipeg

Membership in this group entitles you to attend all regular group meetings and discussion/demonstration sessions. You receive a copy of the monthly newsletter and have an opportunity to meet others with similar interests and level of computer understanding. Also provided are a membership roster that identifies which members have which software/language/hardware/interests and the opportunity to take advantage of bulk discount prices for disks/software/hardware.

For more information, write Hartmut Sager, executive secretary, 350 Dunrobin Ave., Winnipeg, MB, Canada R2K 0T6.

Philadelphia Area Computer Society

Membership in the Philadelphia Area Computer Society is open to all persons interested in any aspect of computer arts and sciences. Regular dues are $15 annually and include a subscription to The Data Bus (monthly newsletter), participation in club projects and subgroups and borrowing privileges in the Society's literature library.

Meetings are the third Saturday of each month on the LaSalle College campus, 20th and Olney Ave. For further information, call the PACS Hotline at 215-276-1831.

CLASSIFIEDS

Classified advertisements are free and are intended for use by persons desiring to buy, sell or trade used computer equipment. No commercial ads are accepted.

Advertising text must reach us 60 days in advance of publication date (i.e., copy for March issue must be received by Jan. 1). The publisher reserves the right to refuse questionable advertisements. Mail copy to **Classified *Microcomputing*, 80 Pine St., Peterborough, NH 03458.**

FOR SALE: CP/M user disk for C-64, $12 each. Boonpat Vattan, 3524 Cottman Ave., Philadelphia, PA 19149 (215-331-8138).

WANTED: TRS-80 software for Model III, 48KB, two floppies. Aaron Paul, PO Box 581, Alexandria, LA 71301.

FOR SALE: IBM portable compatible Hyperion; 256KB RAM; two (320KB) drives; built-in modem; 1-2-3; Aladin database; word processor; BasicA; communications software; and much more. Marv (612-332-0001 or 612-933-3391).

FOR SALE: CAT acoustic modem, $85. IDS 445G printer, $350. Keith (603-924-7981) eves.

FOR SALE: Heath ET-3400A Microprocessor, EWA-3400, ETA-3400-1 optional chip set with EE-3401 Microprocessor course and manuals. Cost $495, will take best offer. Heath H-88-5 cassette interface board with manual and cassette tapes. Will take best offer. Send SASE to Robert Sitton, 507 W. 9th St., Cisco, TX 76437 or will send UPS COD.

WANTED to buy: *A Companion to Robert Uiterwyk's BASIC Interpreters* by David Gardner. Reply to D. Matton, 304 Northland Ave., Stillwater, MN 55082.

WANTED: Atari computer hardware and software. Will buy your Atari gear or trade for mine. Originals only. Send list of what you have or ask for my list for trade. Allen Harberg, Box 38, E. Glastonbury, CT 06025.

FOR SALE: Osborne I computer peripherals and software; 64 KB, double-density drives (202KB each), screen pac (52, 80, 102 columns), Quadram Microfazer printer buffer (256 KB). Software includes: WordStar, Spellguard, Grammatik, Documate/Plus, Footnote, MailMerge, SuperCalc, Superfile, dBase II, Math, M Basic, C Basic, Microlibrarian, Touchtype. A $3000 plus value. Offers to Knowles, Salt Lake City, 801-363-4203.

FOR SALE: Magic Bind/Magic Index, WordStar version. A merge/formatter/indexer for CP/M-80, reviewed in March 84 *Microsystems*. New, with registration, does not work with my printer. Requires a Diablo/NEC compatible printer. $250 ($295 value). John D. Mill, 80 Old Lowell Rd., Westford, MA 01886, 617-692-4467.

WANTED: Back issues of *73 Magazine*, October, 1960; *Access*, Vol. I., Nos. 1, 2, 4 and 5 (1982); *Commander*, 1983, and January, 1984. Buy, borrow or rent *Access*; others, buy only. Neil A. Benson, 6855 Lamar Ave. S., Cottage Grove, MN 55016-1630.

WANTED: Atari 800 and/or peripherals for Atari 800. Must be in good working order. Bob Hendrickson, 12710 Prospect Knols Drive, Bowie, MD 20715.

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Part No.	Description	Price
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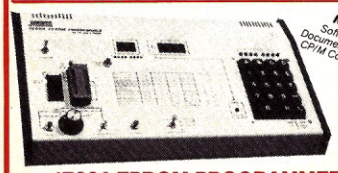

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JE664-A EPROM Programmer. $995.00
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JE665 — RS232C INTERFACE OPTION — The RS232C Interface Option implements computer access to the JE664's RAM. This allows the computer to manipulate, store and transfer EPROM data to and from the JE664. A sample program listing is supplied in MBASIC for CP/M computers. Documentation is provided to adapt the software to other computers with an RS232 port. 9600 Baud, 8-bit word, odd parity and 2 stop bits.

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JM16A	2716, TMS2516 (TI)	25V	Intel, Motorola, Nat., NEC, TI, AMD, Hitachi, Mostek	$14.95
JM16B	TMS2716 (3-V's)	-5V +5V, +12V	Motorola, TI	$14.95
JM32A	TMS2532	25V	Motorola, TI, Hitachi, OKI	$14.95
JM32B	2732	25V	AMD, Fujitsu, NEC, Hitachi, Intel, Mitsubishi, National	$14.95
JM32C	2732A	21V	Fujitsu, Intel	$14.95
JM64A	MCM68764, MCM6B, 764	21V	Motorola	$14.95
JM64B	2764	21V	Intel, Fairchild, OKI	$14.95
JM64C	TMS2564	25V	TI	$14.95

ProModem 1200

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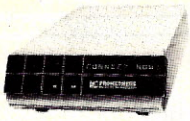

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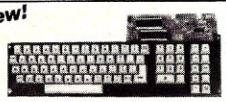

16-9/16"L x 6⅜"W x 1⅝"H

76-Key Serial ASCII Keyboard

• Simple serial interface • SPST mechanical switching • Operates in upper and lower case • Five user function keys: F1-F5 • Six finger edge card connection • Color (keys): tan • Weight: 2 lbs • Data incl.

KB76. . . . . $29.95

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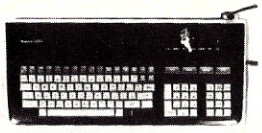

21⅞" L x 9.8" W x 3⅛" H

106-KEY 8-BIT SERIAL ASCII KEYBOARD

• The terminals were designed to be daisy chained around a central host computer and used as individual work stations • Hall effect switching • numeric and cursor keypad • 10 user definable keys • 50" interface cable with 9-pin sub-miniature connector • 7 LED function displays • Security lock • N-key rollover • Automatic key repeat function • Color: (case): white w/black panel–(key caps): grey and blue • Weight: 6½ lbs. • Data included.

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68-Key Keyboard with Numeric Keypad for Apple II and II+

• Plugs directly into Apple II or II+ motherboard with 16-pin ribbon cable connector • 26 special functions • Color (keys): white/grey • Weight: 2 lbs.

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EMA5/6B	5V@3A/6V@2.5A	4⅞"L x 4"W x 2⅛"H	2 lbs.	$29.95
EMA5/6C	5V@6A/6V@5A	5⅝"L x 4⅞"W x 2⅞"H	4 lbs.	$39.95

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PS94VOS. $39.95

KEPCO/TDK 4-OUTPUT SWITCHING POWER SUPPLY

• Ideal for disk drive needs of CRT terminals, microcomputers and video games • Input: 115/230VAC, 50/60Hz • Output: +5V @ 5 Amp, +12V @ 1.8 Amp, +12V @ 2 Amp, -12V @ 0.5 Amp • UL recognized • CSA certified • Size: 7⅜"L x 6-3/16"W x 1⅝"H • Weight: 2 lbs.

MRM 174KF. $59.95

New!

POWER PAC INC. REGULATED POWER SUPPLY

• Perfect for computer systems • Output: +5VDC @ 11 Amps, -5VDC @ 1 Amp, +12VDC @ 2 Amps, -12VDC @ 0.5 Amp and +24VDC @ 3 Amps • Overvoltage protection • Size: 12⅝"L x 6⅝"W x 4⅝"H • Weight: 17 lbs. • Spec incl.

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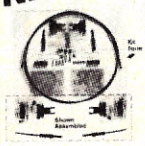

The EDU-LINK fiber optic system is a low-cost, TTL compatible data transmission system designed specifically as an educational tool for students and engineers working in many different industries. Includes: transmitter PCB, a receiver PCB, one meter of plastic optic fiber, and all the necessary electrical hardware • Complete step-by-step instructions, theory of operation, and tutorial information are included.

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ADD-514 (Disk Drive). $195.95
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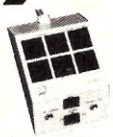

• Eliminates voltage spikes and EMI-RFI noise before it can damage your equipment or cause data loss • 6 month warranty • Power dissipation (100 microseconds): 1,000,000 watts • 6 sockets • 6 foot power cord • Normal line voltage indicator light • Brown out/black out reset switch • Weight: 2 lbs.

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TRS-80 to 16K, 32K, or 48K

**Model 1 = From 4K to 16K Requires (1) One Kit
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Color = From 4K to 16K Requires (1) One Kit**

Model 1 equipped with Expansion Board up to 48K Two Kits Required — One Kit Required for each 16K of Expansion —

TRS-16K3 *200ns for Color & Model III $12.95
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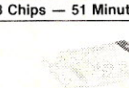
TRS-80 Color 32K or 64K Conversion Kit

Easy to install kits comes complete with 8 ea. 4164-2 (200ns) 64K dynamic RAMs and conversion documentation. Converts TRS-80 color computers with D, E, ET, F and NC circuit boards to 32K. Also converts TRS-80 color computer II to 64K. Flex DOS or OS-9 required to utilize full 64K RAM on all computers.

TRS-64K2. . . . . $44.95

UV-EPROM Eraser

8 Chips — 51 Minutes



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Erases 2708, 2716, 2732, 2764, 2516, 2532, 2564. Erases up to 8 chips within 51 minutes (1 chip in 37 minutes). Maintains constant exposure distance of one inch. Special conductive foam liner eliminates static build-up. Built-in safety lock to prevent UV exposure. Compact — only 9.00" x 3.70" x 2.60". Complete with holding tray for 8 chips.

DE-4 UV-EPROM Eraser . . . $79.95
UVS-11EL Replacement Bulb . . $16.95

NEWS WINDOW

By Eric Grevstad
Senior Writer

After seven months and fewer than 5000 sales, Xerox Corp. has pulled its 1810 portable computer from the market. Sunrise Systems Inc., Xerox's OEM supplier of the $2195 laptop, has filed for bankruptcy under Chapter 11.

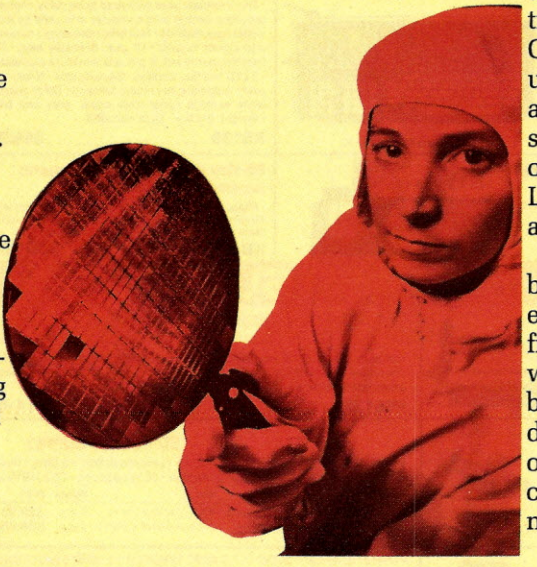
The 1810, with its three-line LCD and abominable word processor, deserves no epitaph other than "Good riddance," but there's hope yet. Xerox is upgrading its computer marketing operations, training its 4000 copier salespeople in the micro side of the business; the company behind Smalltalk and the Star workstation may yet find the mass-market success you'd expect.

Bell Labs' WE 32010 may be awesome, but two silicon rivals are teaming up to match it: Texas Instruments and National Semiconductor have combined forces to bring a 32-bit, Unix-compatible microprocessor to market, competing with AT&T's. National announced the CPU last year; TI will help refine and produce it and supply peripheral chips.

Also, though manufacturers are still using 64K-bit instead of today's 256K-bit devices, IBM has equaled several Japanese firms in producing a megabit RAM chip. The mighty memory module came from a regular production line instead of a fancy lab, but IBM doesn't anticipate volume production any time soon.

First, the minority opinion: The market analysts at San Jose, CA's Creative Strategies Inc., predicting that the home computer software market will top $8 billion by 1988, declare, "IBM's introduction of the PCjr, although the biggest threat to current hardware suppliers, could prove to be quite lucrative for the software and peripherals markets. Many manufacturers will no doubt jump on what will again become the IBM bandwagon."

Now, everyone else's opinion, as expressed by analyst Stephen Goodall of J.D. Power & Associates, Westlake Village, CA: "Those who predicted the PCjr would storm the personal computer market are going to be disappointed." Goodall's firm concludes, "PCjr undershot the business market in capabilities and overshot the home market in price."



Fashions by IBM: Essex Junction, VT, production worker Karen Kaigle displays Big Blue's megabit chips.

In April, IBM Chairman John Opel told 2000 shareholders that Peanut "hasn't yet been as successful as [we] would like it to be"; dealers have cut prices and everyone describes PCjr improvements, led by a real keyboard, as inevitable. *PC Week* went even further, predicting a new Selectric-style keyboard for the senior PC.

Next to a new PCjr keyboard, the most eagerly awaited product in the IBM world is Big Blue's local area network. The prospect of an LAN with IBM's clout has kept office buyers from embracing would-be standards like Ethernet and ARCnet.

However, while data processing managers are on the fence, IBM's network is barely on the horizon. In May, as the corporate world trembled in anticipation, IBM announced the kind of cable its system will use. The network itself won't be ready for two to three years.

"I didn't realize IBM was in the copper business," a sarcastic competitor from Wang Laboratories told the *Wall Street Journal*. Industry analysts described the "IBM Cabling System" as "certainly an underwhelming announcement," and a Pennsylvania consultant said, "I feel betrayed. I've got three customers today waiting to order LAN pilot systems for whom this announcement is a major insult."

The question now is whether buyers will lose patience and shop elsewhere, or whether IBM's unfinished blueprints will prevail—with a little help from that old brand-name magic. Even amid the disappointment, the *Journal* found one analyst to say, "This will become a *de facto* standard overnight."

Ovation Technologies Inc. was embarrassed when reporters questioned a press release describing Ovation as a leader in the integrated software market; it seems the skeptics pointed out Ovation has yet to sell a product. In fact, the firm only recently announced a shipping date for its multifunction package: October 15.

As a member of the computer press (the rude writers were general business reporters and don't understand these things), I'd like to apologize to Ovation. Not only does the product look impressive, the release date is less than a year after its trade debut at Comdex/Fall in November 1983. Gavilan was only a little quicker in shipping its portable; in this advance-notice, venture-capital industry, such speed is positively commendable.□

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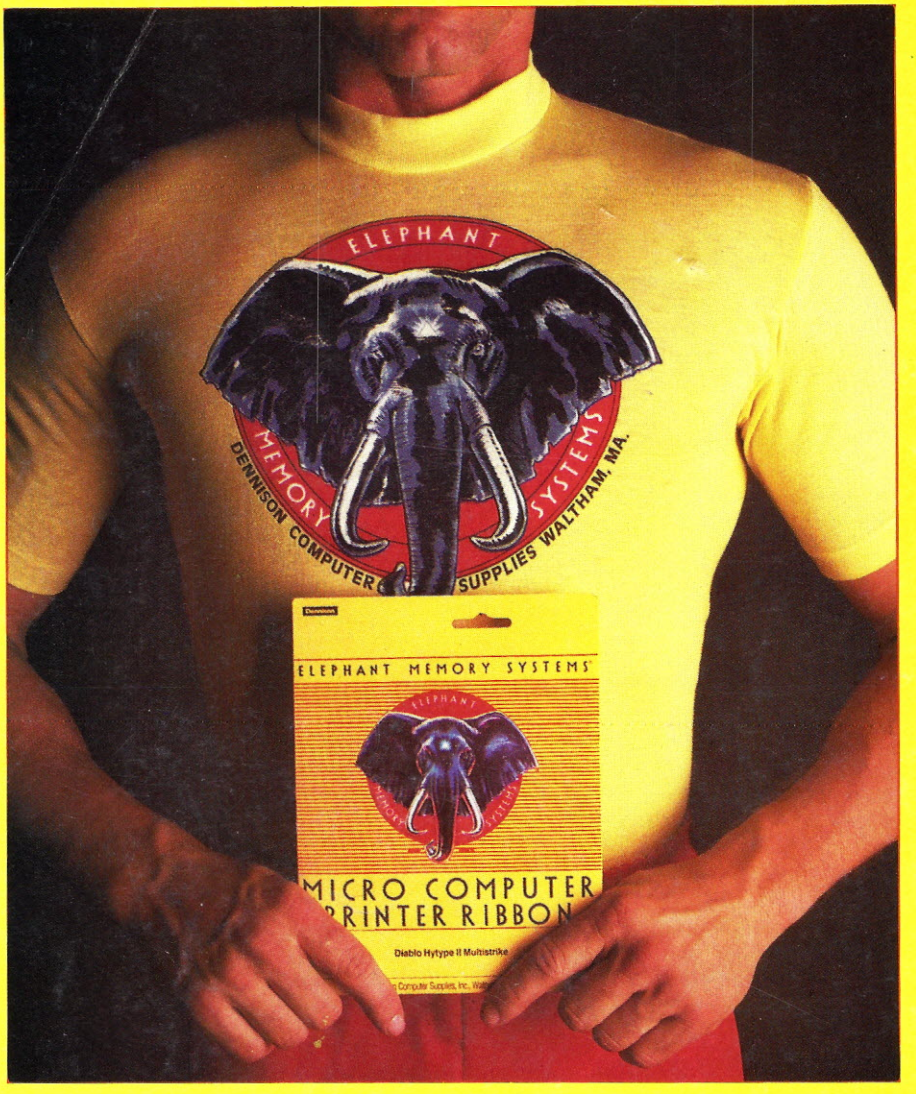

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